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The Archeology of Lake Mead National Recreation Area

An Assessment

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THE ARCHEOLOGY OF LAKE MEAD
NATIONAL RECREATION AREA:
AN ASSESSMENT

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1980

Western Archeological Center
Tucson, Arizona
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National Park Service U.S. Department of the Interior

As the Nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under United States administration.

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We must mention the help of individuals and institutions in making available their survey records; a list of those contacted is given in Table 1 of the report. Richard Brooks was especially helpful in this regard. The cooperation and hospitality of Mike Belshaw made inclusion of a chapter on European occupation of the Lake Mead area a simple and pleasant task.

With all this help, however, the report still needed the editorial skills Paulette Coulter brought to bear. Barbara Pickus turned our scratchings into a rough draft, and Vonna Lou Mason provided the transformation to an elegant final copy. Figures 10 and 11 are provided courtesy of Margaret Lyneis and were taken by Richard McCarty, both of the University of Nevada, Las Vegas. Finally, Brigid Sullivan has provided a delightful garnish with her maps. In the end, if the report has its flaws, it is not for lack of support or borrowed talent, but rather for our own deficiencies.

Tucson, Arizona
August 1978

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DAP

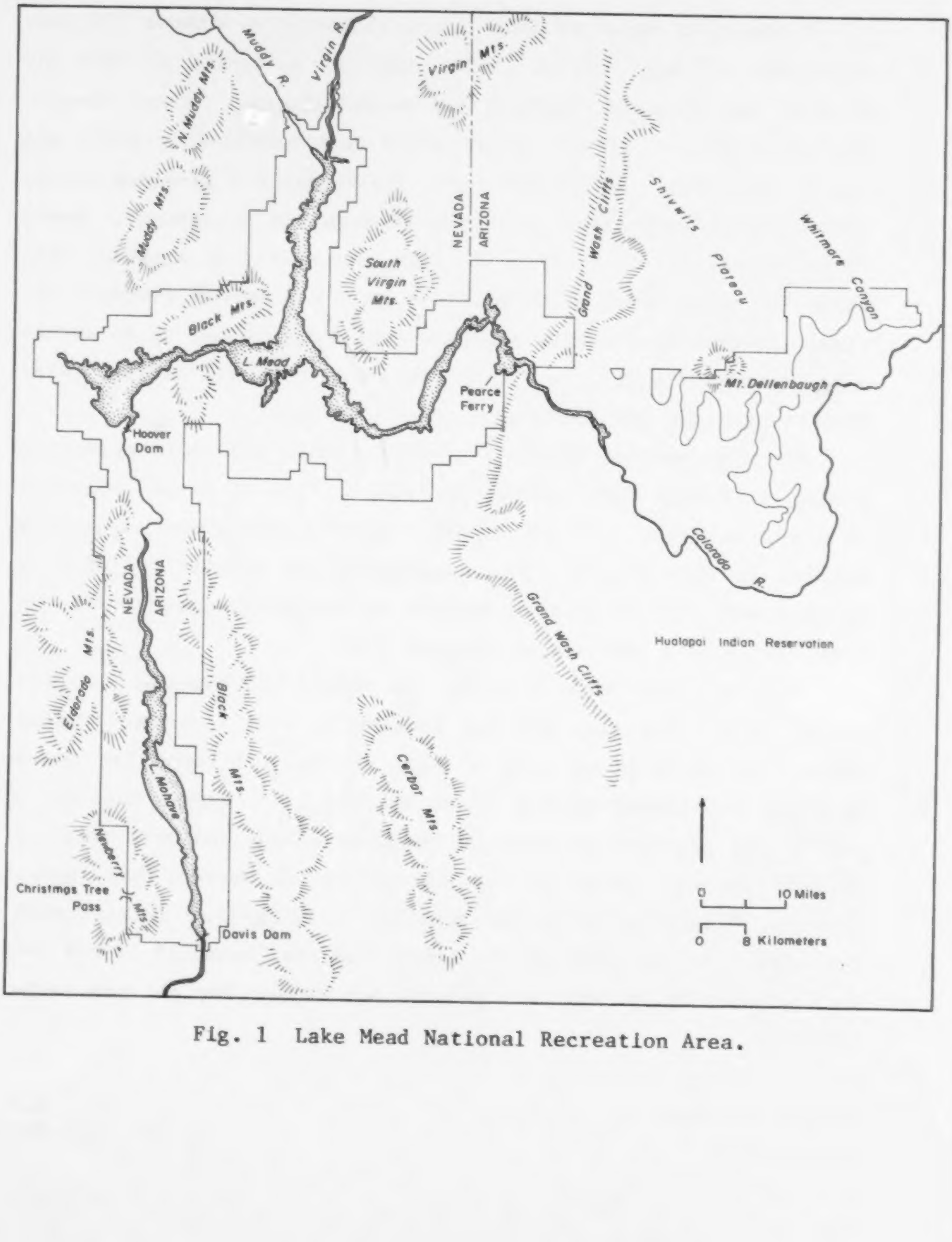

Muddy R.
Virgin R.
N. Muddy Mts.
Virgin Mts.
Muddy Mts.
NEVADA
ARIZONA
South Virgin Mts.
Grand Wash Cliffs
Shivwits Plateau
Whitmore Canyon
Black Mts.
L. Mead
Pearce Ferry
Mt. Dellenbaugh
Hoover Dam
Colorado R.
Hualapai Indian Reservation
Eldorado Mts.
NEVADA
ARIZONA
Black Mts.
Grand Wash Cliffs
Cerbat Mts.
L. Mohave
Newberry Mts.
Christmas Tree Pass
Davis Dam
0 10 Miles
0 8 Kilometers

Fig. 1 Lake Mead National Recreation Area.

Chapter 1

MANAGEMENT SUMMARY

Lake Mead National Recreation Area is marked by geographic and cultural diversity, and it is difficult to provide a comprehensive view of this diversity. Although no report as short as this one can do the area full justice, we feel the main purposes of this study have been accomplished. This assessment of the archeology of Lake Mead was written to aid federal planners who are responsible for managing cultural resources on public lands. We hope that it will also serve as a guide for archeologists working in the Lake Mead area and provide information for interested visitors.

The recreation area includes Lakes Mead and Mohave, and its boundaries parallel the course of the Colorado River before Hoover and Davis Dams were built (Figure 1). The river crossed a variety of landscapes, emerging from the lower Grand Canyon and flowing west, and then south, through the Mohave Desert on its way to the Gulf of California. This region is one of the more rugged and isolated parts of the United States, and archeological remains found here outline a story of how people have survived--or failed to survive--in this harsh land.

The introduction to this report (Chapter 2) gives a brief account of the establishment of the recreation area, a summary of federal regulations that affect the management of cultural resources on public lands, and the background for this study. Chapter 3 provides a description of the natural environment of the area, an appreciation of which is necessary for understanding how people lived there. This is followed, in Chapter 4, by an evaluation of past archeological projects, including a discussion of their contributions to archeological research and their usefulness for planning and management purposes. Chapters 5 and 6 contain the authors' interpretation of what is known about the prehistory and history of Lake Mead. These chapters state our assumptions and biases and form the basis on which we have made recommendations for future research and management.

The research design and management recommendations in the concluding chapters (7 and 8) are directed towards archeologists and federal planners who work with Lake Mead's archeological resources. To do their job, federal managers need to know the significance of archeological resources. This is best achieved by viewing archeological remains in light of current research problems. We have identified four broad research questions for the area: (1) culture history--who occupied the area and when were they there? (2) site function--what were sites used for? (3) site distribution--are site locations predictable? and (4) how did people adapt to arid lands? The answer to the fourth question depends on solving the first three problems and is clearly related to knowledge of the environment. Thus, close cooperation with paleoecologists, who can help us reconstruct the past environmental conditions which people faced, is necessary. With this information, we feel that Lake Mead archeological resources can yield clues as to how people adapted to changing conditions in a harsh environment, information which may be useful to people in arid lands today.

Although archeological research in Lake Mead has gone on for some time, the lack of well-defined and well-coordinated research has left us with only a general idea of what kinds of sites are present and where some of the sites are located. At this time, therefore, we are unable to determine the significance of Lake Mead's archeological resources and are able only to offer hypotheses on where specific kinds of sites might be found. Thus, we recommend the following program: to begin fulfilling Executive Order 11593 (to inventory cultural resources on public lands) we propose a five percent archeological survey of the recreation area. We suggest this survey be done over a period of four years, during which time adjustments can be made in the research design and survey techniques as new information becomes available. We also suggest that many specific decisions regarding the proposed survey be left to the discretion of the project director.

In the suggested survey, we have considered the facts that past research has provided some information on sites at Lake Mead and that we need to evaluate the effects of recreation area activities on archeological resources. Since underwater archeology studies already conducted by the Park Service proved fruitless, our recommendations cover only those lands that are not inundated.

We recommend that complete coverage be given to the heavily used locations listed in Table 3; this constitutes a three percent nonrandom sample. Survey of these locations should decrease the need for small clearance surveys, which have thus far provided little useful information, and should make development planning in these areas more efficient. Another one-half percent nonrandom sample is suggested along existing roads and shorelines in areas not listed in Table 3 but where recreation area activities are also likely to affect sites. In addition, we feel that another one and one-half percent sample is necessary to study holdings not adequately covered by past research or by the nonrandom sample. Most of this one and one-half percent sample should be a random sample using transects, quadrats, or both. However, the project director may wish to use some funds for surveying additional roads, shorelines, or other nonrandomly chosen areas, for reconnaissance by helicopter and boat, or for restudy of prehistoric and historic sites.

Besides the survey, we recommend improving visitor awareness of the need to protect sites. In addition, should any development occur before the proposed survey is completed, or should it take place in areas not specified in our recommendations, cultural resources in the area should continue to be treated under the provisions of Executive Order 11593, the National Historic Preservation Act, and the National Environmental Policy Act. Archeologists carrying out such work can use the background information and research design given in this report as a guide.

As already mentioned, we do not have enough information at present to predict accurately the distribution of sites or to evaluate the significance of most archeological remains at Lake Mead. Some recent studies in the recreation area have found individual sites and, more commonly, groups of sites, to be eligible for nomination to the National Register of Historic Places (Dodge 1975; McClellan and Teague 1977; Teague and McClellan 1978; McClellan and Phillips 1978; Belshaw and Peplow 1978). At present, only one archeological district and three historic sites are being nominated (McClellan and Phillips 1978; Leslie Hart: personal communication). As additional sites or districts are studied, they will undoubtedly be found eligible for National Register nomination because of their scientific, historic, and, in some cases, social significance. Preliminary predictions of site distribution for planning purposes must await testing by the proposed five percent survey.

Chapter 2

INTRODUCTION

Lake Mead National Recreation Area exists because of two dams, Hoover and Davis, built on the Colorado River. These dams were built to provide flood control, water storage, and electricity for the Southwest; however, every year several million visitors camp and boat at the lakes and explore in the surrounding rugged country. Ranching and mining, begun long before the recreation area was established, are still permitted. These modern activities have left their trace in the form of roads, campgrounds, docks, fences, corrals and tanks, ranch buildings, mine claims and prospects, mines, and mining camps. These remains are only the most recent in a long succession, however, for human use of the area began thousands of years ago.

The irregular boundaries of the recreation area (see Figure 1) are set a few miles back from the shores of Lake Mead, formed by Hoover Dam, and of Lake Mohave, formed by Davis Dam. As a result, the recreation area is long and narrow, extending west from the mouth of the Grand Canyon and then turning south along the Arizona-Nevada border to Davis Dam. Part of the area in Arizona is north of the Colorado River, in what is known as the "Arizona Strip." Here, the land is high, with wooded plateaus and steep-sided canyons. In the rest of Arizona and in Nevada, the recreation area lies in desert country interrupted by low ridges and mountain chains. Most of this isolated land is owned by the Federal Government: the Bureau of Reclamation controls the dams, the National Park Service manages the recreation area, and the Bureau of Land Management administers the surrounding land. Only a few small parcels of land inside the recreation area are patented and privately owned.

The Boulder Canyon Project was authorized in 1928. In those days, the dam was an engineering challenge; during the Depression it became a social challenge as well. Work at Boulder Dam started in 1931, and by 1935 the waters of the Colorado had been trapped. A year later the dam was finished, and electricity flowed to cities of the West, but water continued to rise until 1941 when the all-time high, 1220.5 feet, was reached. (The maximum water level is 1229 feet or 375 meters.) The reservoir was named Lake Mead after George Mead, Commissioner of the Bureau of Reclamation at that time. In 1947, the dam's name was changed from Boulder to Hoover.

Davis Dam was started in 1942, but during World War II was stopped because of more pressing needs. The dam was finished in 1953. The reservoir, named Lake Mohave, has a maximum water level of 647 feet or 197 meters.

The rising waters of the lakes covered several historic settlements--Rioville, Callville, St. Thomas, Eldorado Landing--as well as unnumbered prehistoric sites. Prior to the flooding in the thirties, the Civilian Conservation Corps excavated some sites in the lower Virgin and Muddy River Valleys and in the lower Grand Canyon; Gordon Baldwin excavated a few sites in the Lake Mohave flood basin a decade later. For the most part, though, prehistoric and historic sites were covered by the growing lakes without any prior study.

The recreation area was originally called Boulder Dam National Recreation Area but eventually was renamed Lake Mead National Recreation Area. National Park Service management of the recreation area dates from 1936; since that year, a number of boundary changes have been made. In 1947 the Lake Mohave area was added; in the seventies, the lower Grand Canyon was transferred to Grand Canyon National Park. Also, in past years the south side of the lower Grand Canyon was identified as part of the recreation area, but this area is excluded from our study as it is part of the Hualapai Indian Reservation. Several other boundary changes have been proposed. Two sections in the recreation area east of Lake Mohave are being considered, along with other federal land, for transfer to the State of Arizona. The portion of Lake Mead north of the Grand Canyon may become part of the expanded Grand Canyon National Park. This report considers lands currently part of Lake Mead, including lands which may be transferred to Arizona or to Grand Canyon. In some cases, where information is necessary to clarify natural and historical relationships with Lake Mead, adjacent areas are discussed.

Background to This Study

In writing this report, we have attempted to address three audiences--the public, archeologists, and federal planners and managers. We hope that portions of this report, particularly Chapters 2, 3, 5, and 6, will encourage a deeper appreciation of the area's uniqueness. Because the public is curious about the past, archeologists and federal managers have an obligation to interpret and protect significant archeological resources.

As social scientists, archeologists are interested in cultural ecology (how people interact with the environment), culture history (who lived in the area and when they did), and culture process (understanding change in human society). Working from what is already known about the archeology of Lake Mead, we have evaluated what can be learned from the study of the area's archeological resources. On this basis, we outline specific research problems and make recommendations on how to approach the study of Lake Mead's past occupants.

Today, most archeological work at Lake Mead results from federal legislation, whereby archeologists are contracted to study small development areas on an individual basis. Often the archeologist does not have the time to acquire a thorough background on the specific archeological problems for the area under study. As a result, such work has contributed little to a general understanding of the people who once lived in the area. This is one reason why assessments such as this are necessary.

From present trends, increased use of the recreation area seems likely, and this report is designed to help federal planners who must direct its future development. Federal agencies control most remaining tracts of relatively undeveloped land, and it has become necessary to establish policies for managing resources under their control, including prehistoric and historic sites. Management policy for Lake Mead is based on a number of federal laws. Because, in part, this report addresses a public that may not be familiar with the federal laws, these laws are briefly discussed below. (For a more detailed discussion, see McGimsey and Davis 1977.)

The idea of protecting archeological sites is not new. The Antiquities Act of 1906 (Public Law [P.L.] 59-209) protects "antiquities" located on federal lands. (This law is being reviewed to clarify the definition of antiquities.) The Historic Sites Act of 1935 (P.L. 74-292) calls for the preservation of sites "of national historical or archeological significance" by establishing a system of National Historic Landmarks. As its name implies, the Reservoir Salvage Act of 1960 (P.L. 86-523) calls for the study of sites that will be flooded following the building of dams. This last law postdates the formation of Lakes Mead and Mohave and did not affect sites already inundated. However, this act would apply to any future impoundments at Lake Mead or to increases in the maximum water levels of the existing reservoirs. The Archeological and Historic Preservation Act of 1974 (P.L. 93-291) amends the Reservoir Salvage Act to include zones indirectly affected by dam construction, extends protection of sites to all federally assisted construction projects, and authorizes sources of funds.

The National Historic Preservation Act of 1966 (P.L 89-665), as amended in 1976 by P.L. 94-422, has had far-reaching effects on the management of archeological sites. This law established the National Register of Historic Places. Unlike the earlier landmark system, the National Register includes sites not only of national importance but also of regional, state, and local importance. In 1971, federal agencies were directed under Executive Order (E.O.) 11593 (Protection and Enhancement of the Cultural Environment) to inventory cultural resources on lands under their control and to determine their eligibility for nomination to the National Register. This order recognizes the need to identify these resources for evaluation. If a property that is listed on the National Register or that is considered eligible for nomination to the Register will be affected by a major federal action, Section 106 of The National Historical Preservation Act requires that a consultation be made to decide whether the action will damage the property and, if so, what should be done about it. The consultation procedure and the participants of the consultation are specified in the Procedure for the Protection and Enhancement of Historic and Cultural Properties (36 Code of Federal Regulations [C.F.R.] 800). In the same spirit as the National Historic Preservation Act and Executive Order 11593, the National Environmental Policy Act of 1969 (P.L. 91-190) requires that the effects of major federal actions on natural and cultural resources be evaluated, beginning at the earliest planning stages. When resources are considered in the planning process, the adverse effects of a project can be avoided or at least lessened through study of resources before they are destroyed.

These laws do not protect archeological resources from development projects; however, they provide the means by which federal planners and managers can balance the needs of conservation and development.

Methods

This report is only one part of an effort to gather and make available information about the archeology of Lake Mead. The first step was an ethnographic (historic Indian) overview of the recreation area written by Ruppert (1976). The following year, the Archeological Research Center in Nevada completed a review of previous archeological research in the same area (Brooks and others 1977.) Their bibliography, with some additions, is included in this report. Persons interested in a detailed account of historic Indians or past archeological projects at Lake Mead should consult these reports.

The present study is an outgrowth of the authors' work on the

Grand Canyon Adjacent Lands Project (Teague and McClellan 1978) and the Grand Wash Cliffs Project (McClellan and Phillips 1978). In fact, the research design presented in Chapter 7 was developed from ideas presented in the latter report. Belshaw's participation in this report stems from his study of historic resources at Lake Mead (Belshaw and Peplow 1978). Again, those wishing a detailed account of the historic period are referred to that report.

Finally, we are collecting site and survey records from the various institutions that have sponsored archeological work at Lake Mead (see Table 1). A Lake Mead master file is being set up at the Western Archeological Center and includes copies of site survey forms, site cards, maps, references, and clearances. Arizona State Museum (ASM) numbers are being assigned to prehistoric and historic sites for which we have records. We hope that the master file, along with this report, will be useful to archeologists and federal managers who work in the area and that they will help keep the file up-to-date as new information is collected.

TABLE 1

INSTITUTIONS CONTACTED FOR SITE RECORDS

State	Institution	Comments
Arizona	Arizona State Museum, Tucson	records collected
	Arizona State University, Tempe	records collected
	Bureau of Land Management, Phoenix	no information
	Museum of Northern Arizona, Flagstaff	records collected
	Western Archeological Center, Tucson	records collected
California	San Diego Museum of Man, San Diego	records collected
	Southwest Museum, Los Angeles	no information
Colorado	National Park Service, Denver Service Center, Denver	no information
Nevada	Archaeological Research Center (previously Nevada Archaeological Survey, Southern Branch), Museum of Natural History, University of Nevada-Las Vegas	records collected
	Bureau of Land Management, Las Vegas	no information
	Bureau of Reclamation, Boulder City	no reply
	Desert Research Institute, University of Nevada, Reno	no information
	Lake Mead National Recreation Area, Boulder City	records collected
	Lost City Museum, Overton	records collected
	Nevada State Museum, Carson City	records collected
New Mexico	School of American Research, Santa Fe	no information
Utah	Bureau of Land Management, Arizona Strip District, St. George	no information
	Museum of Southern Utah, Southern Utah State College, Cedar City	records collected
	Utah Museum of Natural History, University of Utah, Salt Lake City	no information

Chapter 3

NATURAL SETTING

The Lake Mead area is one of the more rugged and isolated parts of the United States; the casual observer is likely to wonder how people ever survived in such harsh terrain. But survive they did, and the secret of this success is one thing that archeologists are trying to discover. Lake Mead contains great environmental diversity, and an appreciation of the resources this area had to offer is essential to understanding how people lived there.

What were the resources these people used, and where did they find them? How did the availability and distribution of resources affect life styles and the size and distribution of populations in the area? In what ways have available resources been used differently by the prehistoric, historic, and modern peoples? To begin answering questions like these, archeologists study the natural environment.

Archeological deposits can provide direct evidence of what natural resources people were using. Ethnographic, ethnohistoric, and historic accounts can provide indirect evidence. What people were doing, why they chose a particular place to work or live, and what time of the year they occupied such places can often be inferred from comparison of archeological remains with present locations of resources.

An incomplete list of some natural resources at Lake Mead includes plants and animals for food and clothing; water for domestic, farming, ranching, or industrial uses; caves, rock overhangs, stone, wood, and brush for shelter; wood for fire; bone, wood, and stone for tools; and minerals for dietary (salt), decorative (turquoise), or industrial uses. A site location can itself be a resource, chosen because it was level, offered protection from wind or flood, was sunny or shaded, or offered a view of the surrounding country. Certain sites may have been chosen for nearness to one or two resources only, having been used just long enough to obtain what was needed. In the case of permanently occupied sites, a desirable location may have been within range of many different resources, though not necessaily near any one of them. Social factors may have been important; a site may have been chosen because it was safe from enemies or close to friends and allies. In country as rugged as the Lake Mead area, natural routes of travel may also be considered useful resources. Accessibility may explain why some resources were used and others were not.

The location of non-living (abiotic) resources is relatively stable, and their association with human sites is obvious. The location of living (biotic) resources, on the other hand, is more subject to changes caused by fluctuations in climate or by human misuse. Before we can understand the interaction between people and their resources, we must first know what the environment was like in prehistoric and historic times. Today, most of the Lake Mead area is part of the Mohave Desert, but portions of the recreation area--on the plateau and near the major rivers and springs--seem more inviting. What, exactly, the Lake Mead environment was like in the past is a subject of controversy.

Past Environment

Paleoenvironmental researchers, using various sources of information to date and interpret the past environment, agree that around 10,000 to 11,000 years ago there was a shift from a glacial to a postglacial climate. The exact nature of the postglacial period, however, is the subject of controversy. Unfortunately, this is also the time North American archeologists are most interested in, as there is little evidence that human beings entered this continent before 12,000 years ago (Haynes 1969).

For years, most archeologists relied on Kirk Bryan and Ernst Antevs' interpretation of prehistoric climate. After studying geologic processes and deposits, fossils, radiocarbon dates, and tree rings (Antevs 1955), Bryan and Antevs had concluded that the period following the wet, cool glacial period could be subdivided as follows: the Anathermal (8000 to 5500 B.C.), beginning with conditions similar to today's but then becoming warmer and drier; the Altithermal (5500 to 2000 B.C.), which they believe was much hotter and drier than today; and the Medithermal (2000 B.C. to present), characterized by a series of short droughts such as we experience today.

The parts of Bryan and Antevs' reconstruction most used by archeologists are: (1) the change from a glacial to a post-glacial climate and (2) the supposed long period of drought during the Altithermal. During the glacial period, large mammals such as mammoths roamed the Southwest; the denser vegetation of this period was thought necessary for their feeding (Antevs 1959: 32, 34). The increasing dryness of the post-glacial period--and the inferred decrease in vegetation--would, therefore, have caused their extinction. As a result, artifacts found with extinct mammal remains have automatically been assigned to the glacial period, and the change to a drier climate has been used to explain the shift from big game hunting to a more varied strategy of hunting and wild plant gathering.

It is uncertain that the Altithermal was, in fact, a period of drought. While some researchers have even suggested that large parts of the West were unlivable during this period (Baumhoff and Heizer 1965; Hayden 1976), others feel that the intensity of the Altithermal varied from place to place (Hester 1973: 15), affecting some parts of the West and not others. Still others have stated that the Altithermal was not a period of drought.

Martin (1963), who has studied pollen from ancient sites, agrees that a change from glacial to post-glacial conditions took place between 10,000 and 11,000 years ago. However, he argues (1975a, 1975b) that the extinction of many large mammals at this time was caused by overhunting and not by changes in climate. Martin believes that once humans reached the New World, they spread quickly throughout the virgin continent, killing the larger game. More important, Martin disagrees that the Altithermal was a period of extreme drought and concludes that it may, in fact, have been fairly moist. This was a shock to archeologists who had accepted Antevs' earlier interpretation as fact and caused many of them to look for new approaches to the problem.

Antevs' and Martin's studies consider the Southwest as a whole. More recently, studies of pack rat nests from Southwestern deserts (King 1976b; King and Van Devender 1976; Van Devender 1977) have focused on smaller areas. This is important as local conditions may differ considerably from average or regional conditions. In these studies, pollen and debris from pack rat middens have been identified and carbon-14 dated. The use of plant and animal remains (collected from a small area by the pack rat) in combination with pollen (which can travel great distances before settling) found in these nests provides a detailed picture of local conditions within a regional framework (King and Van Devender 1976). Thus far, such studies have concentrated on early post-glacial times, but analysis of more recent middens has also been done. Van Devender (1977) proposes that the full glacial was followed by a transitional period lasting from 11,000 to 8000 years ago. During this time, juniper woodlands, adapted to drying conditions, were found in altitudes as low as 1700 feet (530 m) in what is now the Mohave Desert. Van Devender concludes that the last major vegetation change in the deserts occurred 8000 years ago with the formation or spread of the desert scrub plant communities that characterize the Southwestern deserts today.

Changes in the last 8000 years are not yet clearly defined, but no substantial evidence for Antevs' long period of extreme drought during the Altithermal has been found (Van Devender: personal communication). Van Devender (1977: 192) agrees that the shift from big game hunting to hunting and gathering was related to changes in climate and vegetation, but he argues that the last major change to a desert environment, 8000 years ago, came after the extinction of the large mammals. He further argues that factors other than changes in climate and vegetation caused them to disappear. At the present time, pack rat midden studies are being done in the Lake Mead area and offer an opportunity for understanding local environmental conditions as they changed through time.

In addition to studying long-term environmental changes, it is also important to know the effects of changes that lasted for only a short time. For example, a 10-year drought might not kill pinyon pine trees, but it affects their ability to produce nuts. The loss of an important food source (such as pinyon nuts) for even a few years seriously affects the people who depend on that food. One good indicator of such short-term changes in climate is tree rings. Knowledge that variation in the growth of tree rings as a way to date sites (dendrochronology) is a by-product of studies that try to define past climatic fluctuations (dendroclimatology). These studies include not only the tree's response to annual changes in the amounts of moisture but also to seasonal fluctuations (Burns and Robinson 1972; Kemrer, Robinson, and Dean 1971). No sites from within Lake Mead have been used in this research, and samples from nearby southwestern Utah have so far only been used for dating purposes (Bannister, Dean, and Robinson 1969). However, studies covering the Four Corners region of Colorado, New Mexico, Arizona, and Utah (Dean and Robinson 1977; Robinson and Dean 1969) have provided climatic information that can be extended, with caution, westward to Lake Mead. This research has identified, by 10-year intervals, periods of high and low moisture. Of particular importance to the Lake Mead area is a very dry period from A.D. 1140 to 1189, during which time the Anasazi abandoned the western Arizona Strip. Dendroclimatology research is really just beginning, and studies are needed in the recreation area itself to pinpoint the seasonal and annual climate fluctuations that occurred there.

Changes in vegetation that have occurred during the last century can be identified with historic documents. One study in the Sonoran and Chihuahuan Deserts (Hastings and Turner 1965) has documented changes thought to be the result of a drying climate and overgrazing. In addition, fire suppression and increasing rodent populations have changed local vegetation patterns. Hastings and Turner identified vegetation changes by comparing historic photographs to modern pictures taken at the same locations. Although a similar study has not been done of the Mohave Desert or the Colorado Plateau, severe overgrazing at Lake Mead by cattle, sheep, and feral burro since the 1860's has resulted in the reduction of perennial grasses (Belshaw and Peplow 1978: II, 29; II, 32; Fowler and Fowler 1971: 22; Hansen and others 1976: 250; National Park Service 1975: 37). A recent drying trend is hinted at for the area. Early documents report the existence of more desert springs than are found today; some of these can still be identified by local increases in vegetation due to greater underground moisture (National Park Service 1975: 25). A study similar to that of Hastings and Turner could be done for the Lake Mead area since early photographs are available.

To summarize, there are conflicting opinions on what the past environment of the West was like. Despite this, much recent archeological research has assumed environmental stability through time. However, before we accept the results of such studies, much more work needs to be done to resolve the conflict of opinions about large-scale environmental changes through time as well as to refine our understanding of local conditions and short-term fluctuations. This can be accomplished only by encouraging paleoenvironmental studies like those mentioned above.

Recent Environment

The following discussion describes the Lake Mead environment in broad terms. Our goals are merely (1) to picture for the reader the ruggedness and variability of this country and (2) to locate and describe, in a general way, resources available to people who lived in the area. Depending on one's needs and knowledge, Lake Mead is not as inhospitable as it seems at first glance, particularly if the area is viewed as a whole. The diversity in the natural setting within and adjacent to the Lake Mead area is amazing. There are many small, isolated habitats that result from local variations in soil conditions, exposure, and amount of moisture. In addition, there are abrupt shifts in the natural setting where desert and forest are but a few miles apart. Lake Mead falls within two very different physiographic provinces--Colorado Plateau and Basin and Range.

Colorado Plateau. The Colorado Plateau is represented in the Lake Mead area at its eastern end by the 6400-foot (1950 m) high Shivwits Plateau. Four thousand feet (1220 m) below its rim, the Colorado River has cut into some of the oldest rock on earth, Precambrian schist and granite. Above these are vertical cliffs of limestone and sandstone; one of the sandstone layers forms a wide bench called the Sanup Plateau. (Elsewhere in the western Grand Canyon, this bench is called the Esplanade [McKee, in Breed and Roat 1976: 60].) Above the Sanup Plateau are more cliffs, these of shale and sandstone. The Shivwits Plateau itself is capped by a limestone formation and by patches of a siltstone and sandstone formation. Nodules of chert and chalcedony are eroding from the limestone. Covering much of the southern end of the Shivwits Plateau is a relatively recent (late Cenozoic) basalt flow (Arizona Bureau of Mines 1959; Hamblin, in Breed and Roat 1976: 165, 169). Mt. Dellenbaugh, a volcanic cone that rises abruptly from the plateau surface to an elevation of 6990 feet (2130 m), is the highest point in the recreation area. At its southern end, the Shivwits Plateau is peninsular, surrounded on three sides by deep, steep-sided canyons. To the south, the lower Colorado River gorge is a formidable, though not impassable, natural barrier. The top of the plateau, however, is fairly easy to cross. Motor travel is hampered by basalt boulders strewn on the surface, but other forms of transportation, such as horseback riding or walking, are fairly easy.

Although there are many small knolls and some volcanic cones, much of the plateau surface is level. The drainages flow only after heavy rains or snowmelt. Slopes above these drainages become steeper as they approach the rim of the plateau. Springs are not common on the plateau itself though there are bedrock pockets that hold water for a short time after rains.

Plateau vegetation grows in catron soils, which are dark brownish-gray to black soils high in calcium carbonate and moderately high in organic remains (National Park Service 1975: 19). In scattered depressions on the plateau, there is a sagebrush community where Big Sage is most common, though cacti, grasses, and other low plants are also present. Most of the plateau, however, is covered by a dense woodland of juniper and pinyon pine. Bitterbrush, brittlebush, creosotebush, live oak, hedgehog cactus, beargrass, agave, yucca, and a number of herbaceous plants are found among the trees. Within the juniper and pinyon woods, there are grassy meadows and a few nearly pure stands of ponderosa pine. In addition, on steep southerly slopes, there is sometimes a scrub oak-manzanita community and, on moister northerly slopes, oak woodland. Oaks are also common along some of the plateau drainages.

Although lizards and snakes are found here, they are not as common as at lower elevations. The woods are alive with the songs of birds, and small mammals (squirrels, mice, gophers, blacktail jackrabbits, desert cottontails) abound. Mule deer can be seen browsing in the woods, and bighorn sheep seem to be increasing their numbers. There are also a number of carnivores (bobcat, coyote, gray fox, and possibly mountain lion), and cattle, sheep, and feral burro graze here (National Park Service 1975: 24-25).

In this part of the country, there are two wet and two dry seasons yearly. About equal amounts of precipitation fall during the summer and winter months while spring and autumn are dry (Sellers and Hill 1974: 6-9). Winter precipitation varies more from year to year than summer precipitation (Sellers and Hill 1974: 16). This fact is particularly interesting since, from tree-ring studies, it appears that variations in winter precipitation (and temperature) have a decided effect on crop yields (Burns and Robinson 1972: 30). The plateau receives from 10 to 15 inches (150-380 mm) of precipitation a year; some of the higher areas receive

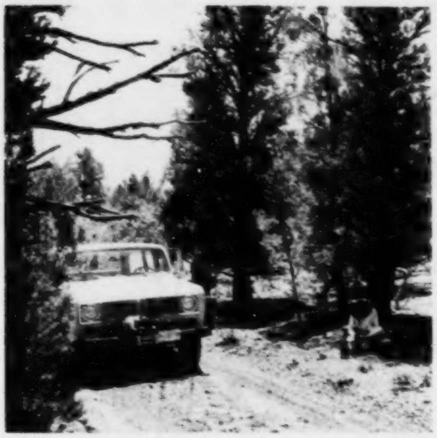


Fig. 2 Pine forest on the Shivwits Plateau.

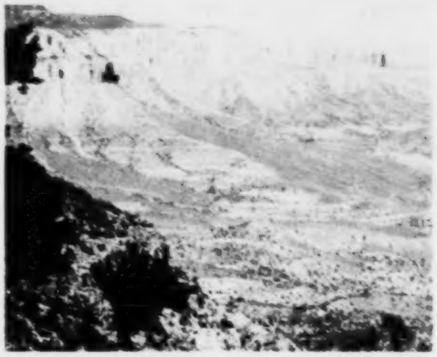


Fig. 3 View along the edge of the Shivwits Plateau showing abrupt dropoff into canyons.

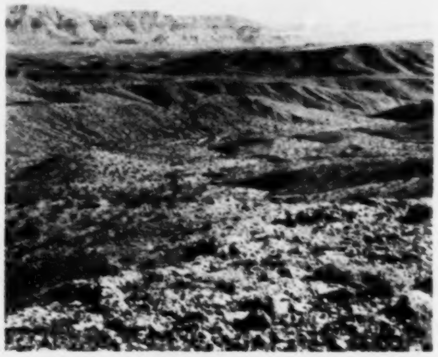


Fig. 4 Alluvial ridges between Grand Wash and Grand Wash Cliffs; the latter are in the far distance.

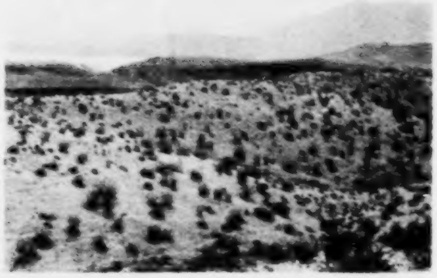


Fig. 5 Creosote-dotted alluvial ridges in Grand Wash area. Lake Mead is in the area of large ridges in the far distance.

more (Sellers and Hill 1974: 6-9). Winter precipitation is usually relatively gentle and contrasts with the violence of summer storms. In the winter, the high plateaus are laden with deep snow. Nights are cold, with temperatures usually in the teens and twenties (-10° to 0° C); however, during the day, it often warms to temperatures in the forties and fifties (5° to 15° C). In contrast, summers on the plateau are pleasant, with temperatures ranging from the seventies to nineties (20° to 35° C) during the day and cooling enough at night that early mornings can actually be chilly. Following heavy summer rains, which predictably fall in the afternoon, huge lakes with muddy bottoms sometimes form in low areas, making motor travel impossible.

Temperatures rise and precipitation decreases as one descends into the deep canyons that border the Shivwits Plateau. Along the cliff walls and on the Esplanade there is very little soil. In the exposed bedrock of the cliffs and Esplanade, a number of rock overhangs have been carved out. Isolated stands of vegetation are found gowing in thin, stony surfaces soils (lithosols) (National Park Service 1975: 19). Plants able to grow there include Mormon tea, agave, yucca, several cacti, rock nettle, evening primrose and brittlebush. Several small mammals live here (pack rats, mice, rock squirrels) as do bighorn sheep, birds, and a few carnivores. Cattle and burro rarely graze here because of the steepness (National Park Service 1975: 23-24). Bats have left deposits of guano, useful as fertilizer, in some of the caves above the lower gorge (Billingsley, in Breed and Roat 1976: 178). Springs, the main permanent sources of water in the plateau country, are found in the sides and bottoms of the canyons. While streams flow following rain or snowmelt, springs are more active following a wet year.

Basin and Range. The plateau region ends abruptly at the Grand Wash Cliffs in a 3000-foot (915 m) drop into the Basin and Range Province. As the Colorado River flows south, the elevation of the basins continues to decrease; the lowest elevation in the recreation area is about 500 feet (150 m), just south of Davis

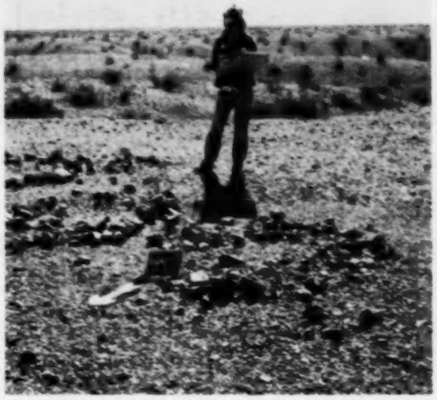


Fig. 6 Desert pavement area near Lake Mohave; small rock circles in foreground.

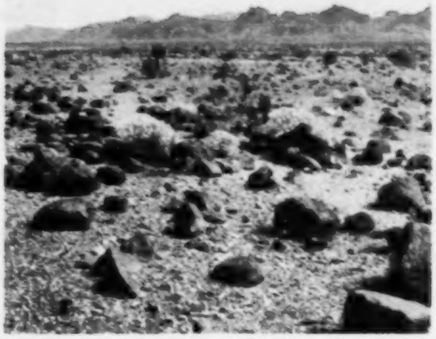


Fig. 7 Area of desert pavement and boulders near Lake Mohave. Note mountains in background.

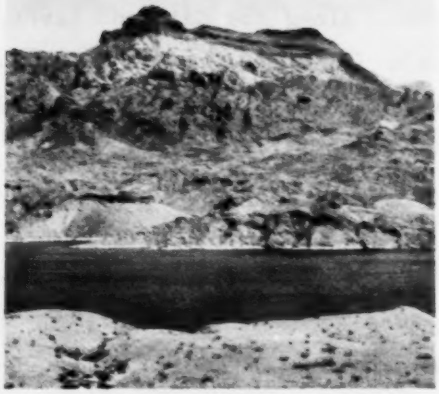


Fig. 8 Lake Mohave.

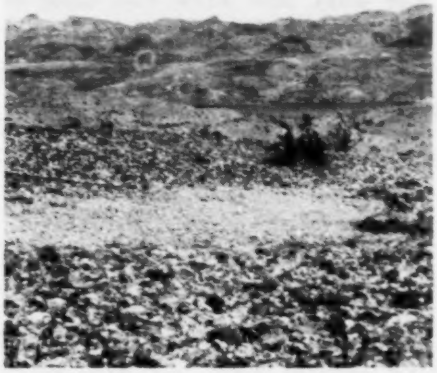


Fig. 9 Bajada area above Lake Mohave visible in background. Note circular clearing.

Dam. The Basin and Range physiographic province contains many isolated, north-south trending mountain ranges formed by tilted fault blocks of Precambrian, Paleozoic, and Mesozoic rocks; in some cases, the older Precambrian granite, schist, and gneiss lie above the younger. Lava flows of rhyolite, andesite, and basalt, dating from later Mesozoic and late Cenozoic times, have covered many of the mountain slopes and are also found in some of the basins. The earlier flows contain some outcrops of obsidian (Arizona Bureau of Mines 1959). The mountains rise to more than 5000 feet (1500 m) and are surrounded and partly buried by late Cenozoic sediments containing fragments of older rocks in the form of conglomerate and gravels as well as clays and silts. There are also beds of gypsum, magnesite, and borax (Dunbar 1966: 373-374). Salt deposits, many now under Lake Mead, are located along the Virgin River. The gravels and conglomerate, especially those with limestone, contain nodules of chert and chalcedony. In some areas--on ridgetops, bajadas, terraces--wind and water erosion has produced gravel pavements; weathering has sometimes caused a varnish to form on stone surfaces. These pavements seem to protect the soil and slow the rate of erosion. Along the Colorado River, there are patches of lake sediments (Arizona Bureau of Mines 1959), possibly deposited at a time when the Colorado was dammed by natural processes (Longwell, in Curriden 1977: 13).

Although not as abrupt as the cliffs below the Plateau, the mountains of the Basin and Range province are also very rugged. Topographic maps make the basin areas appear relatively flat; however, many small drainages dissect these areas. Some portons of this province are so eroded they are considered badlands. Mountain passes and major drainages provide the easiest paths of travel through the mountains, former river terraces, sand dunes, playas, ridges, and hills. In addition, at several points, the Colorado River can be crossed with relative ease.

The Basin and Range country exhibits as much variation as the plateau country since both have similar extremes in elevation. In temperature and precipitation, the basin areas are comparable to the canyon bottoms below the plateau while the higher mountain ranges compare with the plateau top. The main difference between the two provinces is that the Basin and Range province is mostly lowlands with widely spaced mountain ranges while the plateau country is mostly uplands.

The soils in the basins are red desert soils. They are usually high in salts and range from stony alluvial fan deposits to silty interior basin deposits (National Park Service 1975: 19). These soils support the most common plant community found at Lake Mead, the creosotebush community. This vegetation community is dominated by creosotebush and burrobush but includes a number of other low shrubs, yucca, and cacti. Following rains, colorful annuals blossom. The joshuatree community is usually found on bajadas somewhat higher than the creosote bush community (National Park Service 1975: 21-23). There, the soils are the same as the thin, stony surface soils (lithosols) found in the steep-sided canyons of the plateau as well as on the crests and rocky slopes of the basin ranges (National Park Service 1975: 19). In such places, the joshuatree (a yucca) predominates, but there are also other yuccas, Mormon tea, saltbush, several cacti, agave, creosotebush, buckwheats, and annuals. Grasses are more common than in the creosotebush community. Located within the creosotebush and joshuatree communities, near playas, the goosefoot family of plants is most common. Sometimes mesquite trees grow there, and sometimes the playa has no vegetation at all. In this province, as elevation increases, plant communities make transitions similar to those found in the plateau country, and a few of the ranges are high enough to be topped with juniper and pinyon woods.

In the basins, lizards and snakes are the most common animals. This area is within the northernmost range of Gila monsters and desert tortoises. Several bird species, bats, several kinds of small rodents, blacktail jackrabbits, desert cottontails, and carnivores are fairly common. Large wild animals are rare, but cattle and feral burros do graze here (National Park Service 1975: 22-23).

The intermittent streams that run through the basins support the same types of vegetation as the surrounding country but in denser stands. Vegetation such as sedges, rushes, cattails, cottonwoods, mesquite, desert willow, saltcedar (introduced), live oaks, wild grape, and catclaw acacia is thickest at springs, which in this country are located along washes. These plants provide shade and variety in this otherwise monotonous landscape of scattered, low desert shrubs. Fish and frogs are sometimes found in springs. Along the permanent streams--the Muddy, Virgin, and Colorado Rivers--another dramatic change in vegetation occurs. Here can be found cottonwood, willows, saltcedar, desert willow, mesquite, sedges, rushes, gourds, grasses, and cattails. The usual desert animals live here, along with amphibians and fish. Recently, of course, vegetation has changed around the shores of Lakes Mead and Mohave, and the waters have been stocked with introduced species of fish (National Park Service 1975: 29-30).

The precipitation pattern in the basin country is like that of the plateau, with moisture falling mostly in winter and summer. However, snow in the basins is rare, and a large part of the rainfall evaporates. The driest portion of the recreation area is the basins around Lake Mohave; it receives less than 5 inches (130 mm) of rainfall per year. Here summer storms are sporadic and unpredictable. The basins to the north, around Lake Mead, and the deep canyons of the plateau country are slightly wetter, with between 5 and 10 inches (130 to 250 mm) a year. The higher mountain ranges receive about the same amount of moisture as the plateau (Sellers and Hill 1974: 6-14). During heavy rains, some of the drainages flow for a short time, and sometimes flash floods occur. In the basins and the Lower Colorado gorge, extremely hot daytime temperatures, in the 100's (35+° C), begin in late spring and persist throughout the summer; however, some relief comes at night when the temperatures cool to the seventies (20° C). Temperatures in the higher basin ranges are similar to those on the plateau.

Fig. 10 Lake Mead near Overton.

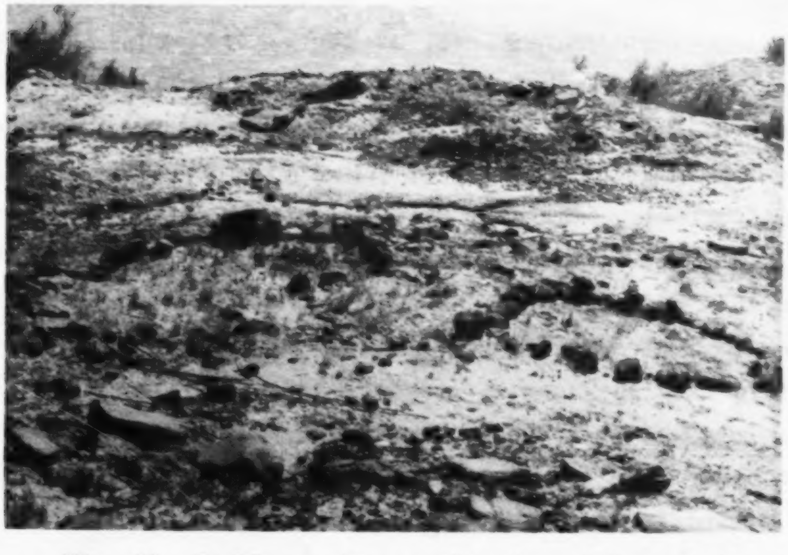


Fig. 11 Puebloan site on the edge of Lake Mead near Overton. This site is below the high-water line for the lake.

Conclusions and Remarks

The need to reconstruct both large-scale as well as localized and short-term fluctuations in past environmental conditions has been shown here. Lake Mead contains sources of information that can be used to achieve this goal. Stratified archeological deposits and pack rat middens, often located in caves and rock overhangs, may contain plant and animal remains and pollen while some sites may contain beams or charcoal that could aid in tree-ring research. Archeological work alone is not sufficient, and archeologists must work closely with paleoenvironmental researchers to identify the locations of these resources.

Examination of existing environmental conditions shows that there is tremendous variability at Lake Mead. Some areas are more comfortable during different seasons of the year. In addition, many resources are not spread evenly throughout the area, and some items such as plants are available only at certain times of the year. These factors certainly affected the movements of people and possibly stimulated trade between groups who exploited different resources.

By analogy with present uses of the environment, it seems possible to infer that people would have avoided the high ranges and plateaus in the winter, due to heavy snows and cold temperatures. Instead, the low-lying areas with their mild winters would have seemed inviting. In the summer, the reverse would be true--who would not forsake the sun-baked desert for a cool grove of pines? It must be remembered, though, that people can range several miles from where they live to obtain needed items; a hunter might venture into snow country to kill a deer, or a group might climb down into the heat of the canyon bottoms for water. Also, other factors may have outweighed comfort, as with the Mohave, who lived year-round in the hot but productive Colorado River valley bottom.

Lists of wild products and how they were used by the historic Indians who lived at Lake Mead--the Mohave, Southern Paiute, and Hualapai--have been compiled by Ruppert (1976). Excavated sites in the Moapa, Virgin, and Colorado River valleys have provided information on what wild products prehistoric peoples may have used (Harrington 1927b; Shutler 1961). Such accounts also provide information on what products were stored to improve people's chances of survival in less abundant seasons or bad years.

Small mammals, birds, and reptiles are found throughout the area. Some animal species, however, are restricted to certain zones--fish to permanent streams and springs, and deer and desert bighorn sheep to the higher elevations. Although animals' habits change with the seasons, most game is available year-round. Areal and seasonal differences in what was hunted were probably related to local custom and availability of other foods more than anything else.

Because of seasonal change and variable temperatures at different elevations, plants become available at different times of the year. Plants begin growing and mature earlier at the lower elevations. By the time these are harvested, those at higher elevations are ripe for harvest. One important product, pinyon nuts, was gathered in the autumn. A few plants, like agave, are available year-round and, thus, could be depended on during bad times.

The success of farming rests on a dependable water supply, a factor that, therefore, directly affected prehistoric and historic peoples who lived in the area. Since rainfall in this country is both low and unpredictable, dry farming cannot be depended on. Instead, farm plots were situated near permanent sources of water--streams and springs. In the canyonlands below the plateau, level arable land is practically nonexistent. Although some farming may have been done at canyon springs, it most probably took place at springs along basin drainages and on floodplains and terraces adjacent to flowing streams.

Other usable resources include chippable stone, which is available in much of the Lake Mead area. Chert, chalcedony, and quartzite nodules are found in gravels on the plateau and in the basins; however, sources of especially desirable stone types, for instance, obsidian, are rare. Sources of building stone, ground stone, and materials for making percussion tools (usually made from rocks like granite, basalt, rhyolite, andesite, quartzite, sandstone) are also abundant but are restricted to the mountain ranges, canyonlands, and only parts of the plateau. Like stone, other building resources vary in their availability. Caves and rock overhangs are not common in the soft, alluvial deposits of the basins or on the plateau top. Brush for temporary shelters is common throughout, but timber is not. Precious minerals and other deposits (gold, turquoise, salt, bat guano, clay) are found in limited quantities and locations. Such special products probably stimulated trade. However, exotic resources are not the only ones that can be traded. For instance, farming groups may have traded their domestic crops for wild products collected by other groups (Ruppert 1976: 68).

Using direct and indirect sources of information, researchers need to verify and expand upon the above remarks. This is not an easy task as there are many environmental and cultural factors that must be considered, and the motives of people are not always apparent in the archeological record. However, much can be learned from studying the relation between cultural remains and the natural environment. This approach is a key to understanding why people lived and worked where they did.

Chapter 4

ARCHEOLOGICAL RESEARCH IN THE LAKE MEAD AREA

Part of any archeological assessment is a review of research done previously in the area under study and an evaluation of the usefulness of the earlier work for management purposes--that is, for planning new construction or management programs. This chapter includes a project-by-project evaluation of research done at Lake Mead. (Some of the smaller efforts are not discussed here but are included in Appendices I and II.) In addition, studies done outside the recreation area, but relevant to the archeology there, are discussed. For the sake of clarity, the discussion is divided into three parts: early work, for the most part done by private institutions; work from the thirties to 1970, related to the creation of Lakes Mead and Mohave; and the work from 1970 on, which is a result of cultural resource management practices. The casual reader may wish to skip to page 47, where a summary is provided.

Early Research

The Colorado River from Grand Wash Cliffs to Bullhead City has been explored ever since Europeans first arrived in this corner of the Southwest. Some explorers described remains they had seen--Jed Smith, for example, mentioned the Virgin salt mines (Dale, in Brooks and others 1977: 16). However, serious archeology did not begin until the 20th century, when Malcolm Rogers and Mark Harrington began their explorations.

Rogers, of the San Diego Museum of Man, shunned more spectacular areas to study the prehistory of the Mohave Desert. He surveyed large parts of southern California and western Arizona, made at least 6000 surface collections, and dug at least one stratified site, the C. W. Harris site near San Diego (1939, 1945, 1966; Warren 1966). His methods were tailored to the surface scatters typical of desert archeology. Rogers based his chronology on the relation of sites to former lakeshores, on differences in patination and desert varnish on artifacts, and on the assumption that tool kits became more complex through time.

Rogers defined three major cultural periods: the San Dieguito, an industry of percussion-flaked stone tools; the Amargosa, which added ground stone; and the Yuman, which added pottery. As he first set it up, the sequence began at 2000 B.C., but carbon-14 dates from the Harris site (Warren 1967) show that the San Dieguito is much older. Also, Rogers' definitions have been changed as other workers have tried to fit their findings into his scheme.

Although Rogers recorded only one site at Lake Mead, he is important for his classification of prehistoric remains in the Mohave Desert. His categories present a problem, however, because the identification of early sites depends largely on negative evidence. An Amargosa site is much like a Yuman site, but lacks pottery; a San Dieguito site resembles an Amargosa site without ground stone. Thus, an historic Paiute site, for example, might conceivably be classified as San Dieguito if it happened to lack the full range of Paiute artifacts. Furthermore, Rogers published rarely and usually did not present the reasoning behind his conclusions; as a result, his work is a source of confusion and argument as well as a contribution to regional prehistory. It is likely that his scheme's usefulness for Lake Mead will be verified only when independent data are derived from early sites in the area.

Like Rogers, Mark Harrington was a pioneer in archeology. From 1924, when he began working in southeastern Nevada, until 1928 he was supported by the Museum of Man (Heye Foundation). In 1928, he joined the staff of the Southwest Museum, which sponsored his later work. From 1928 until 1935, Harrington directed Civilian Conservation Corps digging at sites to be flooded by Lake Mead; after that time, he served as a consultant for this effort. On the basis of his work, Harrington outlined the culture history for the Lake Mead area from Paiute times back to the earliest human use of the region (see Simpson 1965).

Harrington excavated two sites near Lake Mead that seemed to show very early human use of the Southwest. At Gypsum Cave, a few tools were found with Pleistocene animal remains. The association is doubtful, however, and the cultural debris probably is not older than 3000 years. At Tule Springs, Pleistocene remains, an obsidian flake, and what seemed to be charcoal were found, the latter being dated to over 28,000 years. Later work, however, showed that the "charcoal" was old spring vegetation (Shutler and others 1967). Tule Springs is still thought of as an old site, dating to perhaps 11,000 B.C., but not nearly as old as once claimed.

Harrington's work on a later culture, the Virgin Anasazi, centered on the lower Virgin and Moapa valleys, parts of which are in the recreation area. This work is reported in a number of short articles but has also been compiled and reported in a single volume by Richard Shutler (1961). In that volume, several phases of Virgin Branch occupation are defined, with dates based on traded pottery and other links to the chronology of the Kayenta Anasazi to the east. Harrington felt that Virgin Branch peoples had been in the area from A.D. 1 to 1150, at which point they left it for parts unknown.

Harrington's reports on the Anasazi are important for their descriptions of sites now destroyed by Lake Mead. His chronology, as interpreted by Shutler (1961), Aikens (1966), and others, is still used by students of the Virgin Branch. However, the reports are brief and general. His work, therefore, is useful for providing historical background but not for management purposes.

In 1934, Winifred and Harold Gladwin published a classification of Southwestern cultures, in which the terms "branch," "stem," and "root" represented greater degrees of inclusiveness. Time differences within branches were marked by "phases." The Gladwins (1934) assigned remains in western Arizona to the Yuman root, which is roughly equivalent to Rogers' "Yuman Period." However, the Gladwin placement was based on limited data. In 1938, Lyndon Hargrave collected information necessary to classify northwestern Arizona cultures according to the Gladwins' taxonomy. His survey was reported by Harold Colton (1939a), who objected to the use of the term "Yuman" for prehistoric remains. It implied, he felt, an affiliation with historic Yuman speakers. Colton proposed that the noncommittal term "Patayan" be used instead. Although the studies by Hargrave, Colton, and the Gladwins did not take place at Lake Mead, the cultural classifications they developed are still used for remains found there.

Later Research--The Thirties Through the Sixties

In the thirties, sponsorship of archeology at Lake Mead shifted. Whereas work had formerly been sponsored by private institutions (such as the Southwest Museum and the Museum of Man), the federal government now provided the major support for archeological research. Hoover Dam was started in 1930, and though the floodgates were not closed until 1935, it was clear that sites would be destroyed by the new lake. From 1933 to 1939, Civilian Conservation Corps crews under the direction of Fay Perkins and Willis Evans (who had worked for Harrington) worked at sites of the Lower Moapa Valley. According to Reed (1949), "Much of this work was not technically controlled or properly reported." Some of the collections and notes were used by Shutler (1961), but many have been lost over the years. One geological report by Edward Schenk (1935?) mentions remains found at the confluence of the Virgin and Muddy Rivers, and several short articles by Harrington describe work done at Lake Mead at this time. The information contained in the reports is usually brief, and it is not helpful for management purposes except that some sites on Lost City (Moapa Valley) maps possibly can be relocated.

In 1937, Schenk and one assistant explored the lower Grand Wash and the Colorado River upstream from Pierce Ferry. They found "Indian camp sites" at springs in Grand Wash Canyon and a number of shelter sites and mescal pits in the lower Grand Canyon (Schenk 1937b). Survey coverage was very light. Soon afterwards, several rockshelters found by Schenk were excavated by crews under Fay Perkins' direction (Schroeder 1961a: 78-80). Gordon Baldwin was able to do further survey work in the lower Grand Canyon in 1941-1943. He found that caves and rockshelters were the most common type of site, though mescal pits, rock circles, and petroglyphs were also common. Almost all the shelter sites were within 200 vertical feet (60 m) of the Colorado; shelters higher than that had not been used. Baldwin felt that Pueblo sites were located only on the north side of the Colorado, whereas "Patayan" sites were found on both sides of the river.

The lower Grand Canyon is no longer part of Lake Mead though the work there was part of the salvage effort as Lake Mead took form. It is described here as providing interesting, but limited, information for archeological studies in adjacent portions of the recreation area. It was during this work that Rampart Cave was discovered and recognized to be an important deposit of Pleistocene animal remains. The deposits were tested, in hopes of finding artifacts with the early fauna. However, such was not the case, and later work in the cave centered on paleontology (Baldwin 1946a).

In 1940, Gordon Baldwin joined the staff at Boulder City, and in the next three years surveyed in the Overton, Shivwits, western Grand Canyon, and Davis Reservoir areas. He also directed work done by Fay Perkins and the Civilian Conservation Corps in the Muddy River Valley in 1941 and assisted in the paleontological work at Rampart Cave (Reed 1949). On the Shivwits Plateau, which is higher and cooler than the rest of the Lake Mead area, Baldwin found a few pueblos. Most of his sites, however, were surface scatters of artifacts. He felt that the sites were related to those of the Virgin Branch peoples to the west. The report for this survey is brief, and only a few of the sites are plotted or described. Survey coverage was spotty. In sum, Baldwin's survey could be used to relocate a few sites on the Shivwits Plateau but cannot be relied on for management purposes.

In 1943, Baldwin surveyed along the lower Colorado River in the area to be flooded by Lake Mohave. He covered the stretch from Willow Beach to Cottonwood Island, but, with the time and resources at his disposal, coverage must have been very light. Baldwin found 155 historic and prehistoric sites and did some surface collecting. Most of the sites were on "lower sand and gravel flats" bordering the river. Many other sites, he felt, had been destroyed or silted over by the river's floods (Baldwin 1943a). Baldwin concluded that farming had taken place in the river's floodplain and that wild foods had been collected in the surrounding country.

In 1947 and 1948, Baldwin returned to the Mohave flood basin and tested 10(?) sites. He also resurveyed 15 of the sites found in 1943 and recorded five new ones. His report discussed four of the sites in some detail and others briefly. The pottery Baldwin found was mostly Tizon Brown Ware and Lower Colorado Buff Ware; chipped and ground stone and shell were common. Excavations in campsites rarely showed any trace of structures, and then only of brush or other light materials. He did test rock circles at several sites and found that they were built "directly on the gravel hardpan" (Baldwin 1948a: 56). The sites in question are now under water, so Baldwin's survey and excavation reports are not applicable to management needs, but the detailed discussion of certain sites is useful for archeological interpretation. Unfortunately, the excavations were test trenches, and digging techniques were simple; therefore, the information recovered is limited by today's standards.

Almost nothing is known about a survey of the Lake Mohave area done in 1948 by Charles Kepner. A hand-drawn map and site cards (nearly blank) were found in the Museum of Northern Arizona files and show that Kepner found 37 sites along the river. No report has been located.

The part of the Lake Mohave flood basin downstream from Cottonwood Island (and thus not surveyed by Baldwin) was surveyed by Carl Tuthill (1949) of the San Diego Museum of Man. Tuthill's report mentions artifact scatters, camps, cave shelters, stone rings, and shrines, but does not describe or locate the sites. The report is by all standards inadequate.

In 1949 Barton Wright excavated at Catclaw Cave, 15 miles south of Hoover Dam in the northern end of the Mohave flood basin. The cave yielded artifacts (including perishable items), plant remains, and bone. Interestingly, bones of edible fish were common. The site had no visible stratigraphy, but Wright separated the remains into several periods on the basis of typology. The report (Wright 1954) provides a unique description of perishable material culture from the Willow Beach phase (900-1100 A.D.), but interpretation is limited by the lack of visible stratigraphy.

Just five miles upstream, at Willow Beach, Albert Schroeder dug a stratified open campsite. Willis Evans had worked there in 1937, and Baldwin had done more testing in 1948. Schroeder's study stands out because it was published (1961a), because it was detailed, and because it described the earlier work by Evans and Baldwin. Schroeder defined five phases of use (three of them preceramic) that spanned the period 250 B.C.-A.D. 1150. After 1150, the site was used from time to time by Shoshoneans. Schroeder sees Willow Beach as a camp on the California-northern Arizona trade route. This interpretation is supported by trade items from several parts of the Southwest. Schroeder's report also includes some information on sites in the Virgin River, Grand Wash, and Shivwits Plateau areas.

Schroeder's report on Willow Beach (1961a) is considered and careful. The amount of information he assembled on the basis of his digging points to the value of stratified sites. Such sites are almost unknown at Lake Mead, though at least one other site like Willow Beach has been reported (Brooks and others 1977). Drawing from Schroeder's report, we can conclude that such sites are of great archeological value and should be protected from destruction. The report is also useful to archeologists interested in prehistoric chronology. For example, Dobyns and Euler (in Colton 1958) have used Willow Beach data to set a beginning date for Tizon Brown Ware.

Schroeder (1952c) also surveyed the lower Colorado River below Davis Dam south to Mexico and two areas along the lower Gila River. Coverage was spotty, being done by jeep and boat in 24 days (1952c: 1). Although the survey took place outside Lake Mead, Schroeder's conclusions are directly relevant to the archeology of the recreation area. He reorganized Rogers' unpublished identifications of pottery from this region into five series under the name Lower Colorado Buff Ware, a term still in use today. The survey also contributed to Schroeder's later definition of "Hakataya" (1957) for the prehistoric cultures found along or near the lower Colorado River. Over the years, Schroeder came to see these several groups as derivations of a single cultural root and felt that the term "Hakataya" was more appropriate than either "Yuman" (Rogers 1945, Gladwin and Gladwin 1934) or "Patayan" (Colton 1939a). Schroeder reserves the term "Patayan" for upland cultures of western Arizona and opposes it to "Laquish," which includes those cultures along the Colorado River. Not everyone has accepted Schroeder's taxonomy, but it remains the most thoughtful synthesis of western Arizona prehistory.

In 1955 and 1956, Richard Shutler surveyed parts of the Shivwits Plateau and found 21 new sites, including artifact scatters, rockshelters, and one multi-room pueblo. These are mentioned in his report on Lost City (Shutler 1961). Since coverage was not intensive, the survey results are of limited use for planning.

During the fifties, Henry Dobyns (1956) and Robert Euler (1958) studied the distribution of Hualapai and Havasupai Indian sites and were able to deduce a link between these tribes and the prehistoric Cerbat Branch. Their methodology included survey, analysis of previous survey materials, and excavations. Dobyns did use data from Lake Mead sites in his records search, but otherwise the work was done outside the recreation area. The resulting synthesis of Cerbat-Pai historical development, however, will prove helpful for future archeological research on these groups, both of which used the Lake Mead area.

From 1957 to 1970, only isolated instances of archeological research in the Lake Mead area are known. E. L. Davis collected examples of chipped stone from roadsides south of Temple Bar and identified them as part of a "Western Lithic Co-tradition" (Davis and others 1969: 66-69). As a selective collection of a very few artifacts, the study is not useful for planning purposes except to show that the scatters of chipped stone found elsewhere at Lake Mead also occur in that vicinity.

Recent Research

In the seventies, a new burst of fieldwork took place at Lake Mead, a trend directly related to the growth of cultural resource management as a philosophy in archeology and federal planning. For the most part, the work has taken the form of surveys in small areas slated for construction or land transfers.

In 1970, James Maxon worked at Grapevine Cave, a rockshelter in a desert canyon west of Lake Mohave. The deposits there had been churned by rats and pothunters. Maxon felt that the cave had been visited from 900 to 1150 A.D. by the Amacava (ancestral Mohave) and after that by the Paiute. Remains, however, were limited and disturbed. The fact that the cave was excavated to preclude further looting underscores the vulnerability of such sites.

In 1971, Maxon removed a skeleton from an eroding sand bar near the Colorado River, one mile downstream from Willow Beach. The burial was flexed and lay on its left side. Pottery from the sand bar was mostly Parker Buff (Maxon 1971a). The excavation was an isolated salvage job that was necessary to prevent the loss of the remains.

In the same year, the Nevada Archaeological Survey, Southern Divsion, (now the Archaeological Research Center) surveyed a highway right-of-way in the desert upland country north of Lake Mead. No sites were found within the right-of-way, but sleeping circles, chipping stations, rockshelters, and other features were discovered nearby (Brooks and Sedgewick 1971). The report is useful because it identifies and makes recommendations for sites being disturbed by visitor use. Two years later, George Bondley surveyed a transmission line from Boulder City to Parker Dam in terrain that includes desert valleys and mountains. Thirty-one sites were found (only three of these in the recreation area itself). They included chipping stations, stone circles, an aboriginal trail, and Anglo remains (Bondley and Brooks 1973). This report is also useful because it identifies sites that would be affected by construction of the line and makes recommendations should the line be built.

In addition, crews from the Nevada Archaeological Survey surveyed a number of small areas near the shores of Lakes Mead and Mohave during the years 1971-1974. Most of the areas had already been developed or were being developed at the time of the survey, but several were undeveloped areas that experience heavy tourist use. The survey is summarized in Table 2. As can be seen, most of the sites were house circles, chipped stone scatters, and other remains typical of Mohave Desert archeology (Brooks and others 1974). The report is useful since it locates and describes sites and includes recommendations for their management. The areas surveyed, though, were very restricted; usually they did not extend beyond the limits of construction and heavy use. In many cases, the report recommends additional, more extensive survey of these areas.

In 1975, a crew from the Western Archeological Center, under the direction of Yvonne Stewart, surveyed Overton Beach along the shore of Lake Mead and along the access road from the main highway (Dodge 1975). These areas have been proposed for development. Coverage was intensive; the survey found widely scattered chipped stone on terraces and ridge slopes, as well as unexplained small circles of rocks. Dodge felt that the stone chipping was related to the portion of "Lost City" now flooded by Lake Mead. Dodge's report is useful; it located remains that would be destroyed by construction and makes recommendations should the construction take place. Dodge felt that the surveyed remains warrant nomination to the National Register but suggested that nomination be deferred until the extent of the lithic scatters can be determined.

TABLE 2

AREAS SURVEYED BY NEVADA ARCHAEOLOGICAL SURVEY, SOUTHERN DIVISION, 1971-1974
(From Brooks and others 1974)

ARIZONA:

Location	Setting	Findings
Bonelli Landing	alluvial fans	none at survey area; chipped stone scatter nearby
Detrital Wash	alluvial valley	chipped stone workshops
Detrital Wash Landing	alluvial valley, low hills	chipped stone scatters
Fortification Hill Landing	not described	brief reconnaissance only; no sites found
Katherine Landing	dissected alluvial fans or low terraces of Colorado River	rock circles, chipped stone scatters
Pierce Ferry	wash and valley	isolated stone flakes
South Cove	wash and valley	historic dugout, blockhouse, tent foundations, trash dump
Temple Bar	low, rolling hills	chipped stone scatters
Willow Beach	alluvial fans near Colorado River	house circles, scattered chipped stone, historic corrals
NEVADA:		
Boulder Beach and Island	alluvial fan and ridges	none
Callville Bay	steep ridges	none
Callville Wash	not described	brief reconnaissance only

TABLE 2 (cont.)

NEVADA: (cont.)

Location	Setting	Findings
Christmas Tree Pass	Newberry Mountains (low desert mountains)	rockshelter
Cottonwood Cove	dissected alluvial fans or terraces once overlooking Colorado	circular depressions, chipped stone scatters, rockshelters
Echo Bay	long, flat alluvial ridges, deep wash	none
Gypsum Wash	low, level ridges	chipped stone concentrations
Highway 1C	low mountain pass	none
Highway 1E	not described	none
Las Vegas Beach and Wash	dissected alluvial fan	house circles, chipped stone scatters
Nelson Landing	alluvial ridges once overlooking Colorado	historic cemetery, probable Indian trails, house circles, chipped stone scatters and workshops, rock alignments
Rogers Spring, Blue Spring, and Stewart Point	low alluvial ridges near fault-scarp; fault-caused springs	large rockshelter, lithic scatters, house circles, burnt rock sites, historic irrigation canals, tropical fish ponds

In the same year, Kathleen Quinn carried out two limited but intensive surveys at Callville Bay for the Western Archeological Center. One was in a proposed residential area, where she found a few scattered artifacts and recommended that they be collected. In 1976, she returned to the residential area and collected the artifacts (Quinn 1976a). The other survey was for a nearby telephone cable route, along which no sites were found (Quinn 1975). The reports are adequate for clearance purposes, but the studies were restricted to small areas and thus are of limited use for archeological interpretations or future planning.

In 1975, Roger Kelly of the National Park Service supervised excavation of an arrastra (a crude mill in which ore is crushed by a dragged stone), for the purpose of building a replica at the Temple Bar Visitor's Center. Artifacts were recorded but not removed, and the site was backfilled after work was completed so that the arrastra retains its archeological value (Kelly 1978). A final report is being prepared.

In 1976, Thomas King intensively surveyed a powerline route near Boulder Beach for the Western Archeological Center. He found a small erosion cave used as a shelter, two oval depressions, rock rings, and rock clusters (King 1976a). King's report identified sites that would be destroyed by construction; however, the sites were small and few interpretations could be made. King felt that the rock rings he encountered may have been used for cooking plant foods.

In the same year, Quinn surveyed a proposed residential area and right-of-way near Overton Beach. The areas, marked by ridges and deep ravines, yielded only a few clusters and isolated cases of chipped stone. Quinn's report (1976c) argued against development but made recommendations should this become necessary. It is useful for this reason, but deals with limited archeological remains.

The surveys and excavation just discussed took place at or near Lake Mead; in 1976 Quinn surveyed in the Fire Mountain area west of Lake Mohave for the Western Archeological Center. The area was proposed for a marina, and development would have extended from the foothills of the Eldorado Mountains to low alluvial ridges and terraces bordering the lake. Survey coverage was most intensive on ridgetops and upper slopes; one portion of the area was not surveyed at all due to lack of time. Fifty-three sites were found, including claim or survey markers, artifact scatters, and rock circles. Quinn concluded that natural resources, especially chippable stone, must have drawn people into the area (Quinn 1976b). The report is useful, as it identifies sites and makes recommendations for their management. It is also informative to archeologists because Quinn provides interpretations of the remains she found. Even though the survey coverage was not complete, enough of the area was covered to allow planning. Quinn suggested that the marina not be built in order to protect the sites.

In 1977 a crew from the Western Archeological Center, supervised by Patricia Gilman, surveyed 16½ sections near the southern end of Lake Mohave; these sections are desert uplands characterized by surface gravels. The sections are part of a proposed land exchange; only two of them are actually within the recreation area. One hundred and forty sites were found. These include the historic townsite of Katherine (related to the mine of the same name), eight other historic sites (most near the townsite), scatters of chipped stone, rock circles, petroglyph areas, trails, a rockshelter, and a site where ground stone tools were made. Prehistoric sites had been chosen in relation to sources of chippable stone and to places with a good view of the surrounding countryside. Nancy Curriden, who prepared the report, felt that the area had been used for thousands of years; she declined to assign dates to specific remains, however, since few of them were diagnostic (1977: 19-20). The report is useful for management purposes because it identifies and locates sites in the lands proposed for transfer and makes specific recommendations for their management. One site (the Katherine Townsite) and an archeological district were nominated to the National Register of Historic Places; however, neither is located within the Lake Mead area.

In 1977 a crew from the Archaeological Research Center, Las Vegas, surveyed in Black Canyon south of Hoover Dam for the Bureau of Reclamation. Although Lake Mohave reaches into it at high water, the canyon is the last essentially undisturbed portion of the Colorado River in the recreation area and is thus of special interest. Six prehistoric sites and a number of historic ones, the latter relating to mining or the building of Hoover Dam, were found. One of the sites, "Willow Beach #2," contains stratified deposits, almost unique for sites at Lake Mead (Brooks and others 1977). The survey did not cover the most precipitous parts of the gorge; presumably, such areas would not contain sites. The report is useful for management purposes as it identifies sites that would be disturbed by flooding.

In the same year, Richard Holmer surveyed mineral lease areas in the Whitmore-Parashant area of the Shivwits Plateau. He found 14 sites in his intensive survey; these included scatters of chipped stone, rockshelters, and a pictograph site. The rockshelters included masonry walls, probably parts of storage rooms or windbreaks (Holmer 1977). The report is useful as it locates sites that would be disturbed by mining. Holmer recommends further study of the remains if disturbance becomes necessary.

The Western Archeological Center also carried out a survey in the Shivwits portion of Lake Mead in 1977 as part of a study of lands adjacent to the Grand Canyon (Teague and McClellan 1977). This study also included Forest Service and Bureau of Land Management lands being considered for transfer to Grand Canyon National Park. Teague and McClellan surveyed sites along a number of short transects--an areal sample of less than one percent--and surveyed about five percent of the area by helicopter. Evidence of Archaic, Anasazi, Paiute, and Anglo occupation was found. Most of the sites were chipped stone scatters, chipping stations, or camps, but cliff granaries and rock art were also noted. Base camps, defined by the authors as sites with a fairly wide range of artifacts and features but probably used seasonally, occurred in upland forest areas. Small scatters and temporary campsites were found mostly in lowland or grassland areas. Sites were located several miles from the nearest reliable water source. Although multi-room sites are known for this area (Baldwin 1942b; Shutler 1961), the fact that none were found in the sample areas suggests that such sites are not commmon.

Teague and McClellan were not able to derive an objective estimate of the number of small sites in their 730 square mile (1890 sq. km) study area but concluded there were about 3000. The report provides new information about culture history and settlement on the Shivwits Plateau, in part because the use of random sampling focused attention on types of sites often slighted by earlier surveys. However, coverage was so light that the report is not useful for judging the effects of any particular construction project on the Shivwits Plateau; any such work will require more intensive survey.

The same crew intensively surveyed three sections near Grand Wash, in uplands of the Mohave Desert (McClellan and Teague 1977). A year later, in 1978, intensive survey of 11 adjoining sections took place. The two surveys (of oil and gas leases) were discussed together in one final report (McClellan and Phillips 1978). Remains were almost exclusively chipping stations or isolated chipped stone; sites were found where nodules of chippable stone could be obtained in the local gravels. Over a thousand chipping stations were recorded, as opposed to only four definite campsites. Because it identifies sites in the survey area and makes recommendations for their administration, the survey is useful for management purposes. The survey area is being nominated to the National Register of Historic Places.

Recently, a historic study of Lake Mead was carried out by Mike Belshaw and Ed Peplow (1978); parts of their study are summarized in Chapter 6. Although the viewpoint of their research is historical, much of the information is useful for archeologists studying the Anglo occupation of Lake Mead. In fact, Belshaw (in the report and in personal communication) recommends archeological study of historic sites to supplement documents and informant data. The report concludes that only a few of the historic sites within Lake Mead warrant nomination to the National Register on purely historical grounds, but it is clear from the report and from consultation with Belshaw that many more would warrant nomination if archeological criteria were used. The report is useful for management purposes in identifying the major historic sites at Lake Mead, but not all historic resources in the recreation area are included; such sites must continue to be identified and studied through archeological survey.

There have been other, smaller studies at Lake Mead in the seventies, usually done for clearances. The various small reports and letters of clearance related to these surveys have been copied and collected in the Lake Mead survey files being set up, and the surveys are included in Appendix II. The same evaluation applies to all of these: although they fulfilled management needs (usually for clearance), the reports are so brief that they are of little use to archeologists. The collections, though, may prove useful as more of them are accumulated.

At present, it seems that development and management plans will continue to stimulate archeological work at Lake Mead. The Bureau of Land Management is also sponsoring archeological research in areas adjacent to Lake Mead for purposes of long-range planning. As the results of these efforts become available, it seems likely that a regional synthesis, based on extensive and carefully recorded data, will become possible for the first time.

Summary and Remarks

The development of archeological research in the Lake Mead area is fairly straightforward and instructive. Early work by Rogers, Harrington, and their colleagues was extensive and acceptable by the standards of the day but was poorly reported. Research was sponsored for the most part by museums, notably the Heye Foundation, the Southwest Museum, and the San Diego Museum of Man. Museum funding of research may explain why many published reports took the form of short articles in museum journals.

In the thirties and forties, sponsorship of fieldwork shifted to the federal government, which had an abundance of labor and needed to salvage information from sites about to be flooded by Lakes Mead and Mohave. The work was hurried; in some cases, we are told, the waters of Lake Mead spilled into pithouses as they were being dug. The amount of work done was impressive, but it was poorly recorded and rarely published.

When Lake Mead was formed, only that part of the junction of the Muddy and Virgin Rivers had been surveyed adequately by archeologists. Shutler shows a map (1961: Pl. 7) in which the lower Grand Wash and the Colorado River upstream from that wash are marked as being surveyed. However, coverage for most of that area was cursory (see Schenk 1937). In other words, most of the Lake Mead flood basin had never been studied by archeologists by the time the lake formed, and there is no way to know what sites once existed there.

The Lake Mohave basin was surveyed before flooding began, but the results are of limited usefulness. Baldwin's survey and excavation in the upper flood basin and Tuthill's survey of the lower basin provide some information about sites that were later destroyed. However, their inventory of sites was neither detailed nor complete.

The most useful reports on the early work at Lake Mead are not by the original researchers but by Shutler (1961) and Schroeder (1961a), who worked with old collections and notes. In Shutler's case, though, the loss of notes and collections hampered his interpretations. He estimates (1961: 22), for example, that the pottery from about half the Lost City sites had been lost by the time of his study.

In sum, the greatest loss of information on the archeology of Lake Mead occurred when sites were destroyed by flooding. Still, there is a certain irony in that loss. Survey and excavation were done in areas now under water, and if reports had been more detailed, notes more carefully written, or collections more carefully stored, the loss of information would have been much less.

The fifties and sixties saw a lull in archeology at Lake Mead. In the seventies, however, an emphasis on cultural resource management has meant a new burst of government-sponsored archeology. Where earlier work was concentrated in the river valleys, now flooded, the new surveys tend to be along the lakeshores, in what was once desert uplands. It is not surprising, then, that recent surveys tend to find sleeping circles, trails, and artifact scatters, in contrast to the farming villages and large campsites reported by earlier workers. The difference is heightened by the practice, in previous years, of looking for architecture or rock shelters and ignoring less substantial remains.

The recent reports are adequate for management purposes, but they do leave room for improvement. In most cases, they merely describe remains found; interpretations or comparisons with earlier work are rare. Also, many recent surveys have been small, so substantial results or syntheses are usually lacking. As a result, such surveys have added little to our understanding of the area's prehistory. On the whole, the quality of archeological reports is as much a matter of concern in the seventies as it was in the earlier decades. In the two chapters that follow, we have tried to synthesize information from these reports and from other sources to give an outline of prehistoric and historic cultural developments at Lake Mead.

Chapter 5

INDIAN OCCUPATION

Although people have lived in the Southwest for about 12,000 years, no good evidence for the earliest cultures has been found at Lake Mead. The first definite use of the recreation area took place during the Archaic, some time after 3000 B.C. Peoples of this period depended on wild plant foods and small game for survival and ranged through their territories in seasonal pursuit of these foods. Eventually, though, the Archaic yielded to a new way of life. Farming, settled village life, and pottery making were introduced to Lake Mead, and although these practices grew or declined in importance through time, they marked human use of the area through historic times. Indian occupation of the area did not end with the coming of Europeans, for aboriginal groups--Paiute, Mohave, Hualapai--continued to live in the Lake Mead area until the end of the last century. In the sections that follow, we have tried to draw from archeological and ethnographic accounts and present a description of Indian groups that once used the area.

Lithic and Archaic Stages

No one is sure when people first entered the New World from the Old. The best evidence (Haynes 1969; Martin 1973) suggests that it happened at the end of the glacial period, about 12,000 years ago, and that people spread quickly throughout the continent. However, for the first several thousand years of this occupation (the Lithic stage), evidence for human use of the area is slight.

It seems likely, though, that future work will prove that early cultures were indeed present in the area. A fragment of a fluted projectile point found in the Arizona Strip hints that early big-game hunters may have ranged that far west (R. Malcomsen:

personal communication). However, early remains at Lake Mead, once identified, are more likely to resemble those of the San Dieguito tradition. This is an early, poorly understood, chipped stone industry from California and western Arizona, characterized by crudely made choppers, bifaces, planes, and scrapers. Many of the artifacts have been interpreted as woodworking tools and would presumably have been used before Southwestern lowlands became desert 8000 years ago. According to some workers, the San Dieguito may have stemmed from an earlier culture in the Northwest that was adapted to woodlands and grasslands (Warren 1967: 181; Davis and others 1969: 77).

Small bands of San Dieguito peoples may have hunted and gathered wild foods in the mountains, along the shores of lakes now dry, and in the valleys of rivers such as the Colorado. However, their use of wild foods may not have been as sophisticated as that of later peoples. They lacked milling stones, used for grinding seeds into meal, and thus may not have used a number of seed foods eaten in later times (Warren 1967: 182; Davis and others 1969: 22).

The San Dieguito is poorly known, in part because only one site has yielded radiocarbon dates (Warren 1967) and in part because the remains are difficult to distinguish from those of later cultures. However, the earliest Southwesterners probably did not ignore the Colorado River valley, and someday it should be possible to talk about this period with more confidence.

From perhaps 3000 B.C. on, the Lake Mead area was at least visited by Archaic peoples, as shown by findings of distinctive dart-point styles. These people used a wider range of wild plant foods than did earlier inhabitants of the Southwest. One innovation of this period was the milling stone, used for grinding seeds into meal. Dry cave sites have yielded an impressive variety of goods--such as basketry, sandals, and rabbit-fur robes--and food remains such as pinyon nuts, agave, grass seeds, and the bones of small animals. Such remains are often interpreted by comparison with the activities of historic Great Basin Indians, especially the Paiute. According to Julian Steward (1938) and others, groups such as the Paiute lived in small bands of close relatives and wandered from place to place to harvest various plant foods as they ripened. Although the importance of a given food differed from one place to the next, hunting was less important than plant and seed collecting; the most common quarry was rabbits and other small game. Similar behavior is inferred for Archaic peoples, since their sites yield a comparable mix of plant and animal remains.

If we can extend the analogy further, Archaic peoples probably set up permanent camps at locations that avoided extremes in temperature or elevation. From there, they ranged out to temporary camps, which were set up close to some useful resource--for example, near pinyon groves in the fall. Shelters were made of brush and other perishable materials. Few such sites have actually been identified--probably because Archaic sites are difficult to distinguish from those of other periods. The only truly diagnostic artifacts for this period are dart points of various styles, but many sites do not contain them.

Archeologists are only beginning to test and expand on the model provided by historic Great Basin groups. Thomas (1973) tested Steward's model of Great Basin settlement patterns against archeological remains in the Reese River Valley of Utah and found a close fit between the model and the actual remains. Another project in the Chaco River Valley of New Mexico concluded that Archaic sites were located in areas with a high plant diversity (Reher and Witter 1977). Despite the difficulty in identifying Archaic sites, it seems likely that in the future our understanding of these peoples will be based less on untested comparisons and more on hard data.

Virgin Anasazi

At about 1 A.D., a new way of life appeared in the Lake Mead area. The hunting-and-gathering pattern that had marked the Archaic for thousands of years now altered to include farming, and people of the area began to dig pithouses and live in villages. Other innovations followed in time: pottery making, above-ground masonry pueblos, the weaving of cotton into cloth.

The origin of these people, the Virgin Branch Anasazi, is unknown. Almost certainly they derived from Archaic forebears, but it is not clear whether the Virgin culture developed in place or whether it was brought in by Kayenta Anasazi from the east. There are many cultural similarities between the Virgin and Kayenta Branches, and Aikens (1966) concluded that they were, in essence, the same culture.

Virgin Branch settlement was heaviest along the lower Muddy River in the Moapa Valley (an area sometimes called "Lost City"). There, pithouse and mud-and-stone pueblo villages dotted the knolls above the fertile valley floor where corn, beans, squash, and cotton were grown. Wild foods were still used, though; a partial list of food remains from Moapa Valley sites includes agave (in the form of "quids" of chewed fiber), mesquite beans, pinyon nuts, yucca, cattail, wild gourd, and bones of deer, mountain sheep, and rabbit (Harrington 1927b).

Wild foods were probably more important in parts of the Virgin area where there were no permanent streams for irrigating crops. In such areas, small plots could have been planted at springs, but at present rainfall is too low and too unpredictable for dry farming in most of the area. A little rainfall farming may have been done on the Shivwits Plateau, and Baldwin (1942b) reported one instance of check dams (farm plots in rills) in Whitmore Wash. The produce from such farming probably only supplemented wild foods.

The Virgin people built a number of pueblos in the Moapa Valley and sometimes elsewhere. The walls of these structures were usually a mixture of wattle-and-daub and uncoursed masonry, the latter often being more mud than stone. However, on the Shivwits Plateau, the Virgin people often lived in camps that left no trace of architecture. Many of these camps were in the open and may have included brush or wattle-and-daub shelters as a protection from the elements. Pueblos and campsites alike were probably used seasonally, though the pueblos were probably used less sporadically than the camps.

The Virgin people were active traders. Their sites have yielded such items as shell, turquoise, ocher, and copper ore, as well as pottery imported from northern and western Arizona. One site, Willow Beach, was a campsite on the trade route between northern Arizona and California (Schroeder 1961a). The Sullivan Turquoise mine, near Boulder City, was worked by Virgin Anasazi, who pounded the surface veins with stone hammers and who may have cracked the rock with alternate heating and cooling (Harrington 1936b). Two other sites in the recreation area may also have been mined for turquoise (Belshaw and Peplow 1978). Far more extensive, however, were the salt mines along the Virgin River. There, the Virgin people tunneled far into the sides of hills, beating the salt loose with their hammers. When Harrington visited these sites in the twenties, he found stone hammerheads still hafted to wooden handles (Harrington 1927b). Turquoise, salt, and a third Virgin Branch product, cotton textiles, would have been useful trade items.

Shutler (1961), Aikens (1966), and others have defined several phases of Virgin Branch prehistory. Unfortunately, the sequence is based primarily on ceramic parallels with the Kayenta area, where pottery styles have been dated with tree rings, rather than on independent dates from the Virgin area itself. Still, the phases are the only real framework in which Virgin Branch culture history can be discussed.

Moapa Phase (Basketmaker II, A.D. 1-500). This represents the time when peoples of the Virgin area had begun to farm but had not yet started making pottery. Wild foods and hunting were still important. Moapa phase sites have been found at the junction of the Virgin and Muddy Rivers and in the upper Moapa Valley (Harrington 1937b; Schroeder 1953a, 1953b; Shutler 1961: 5-6). At this time, people lived in pithouses ranging in size from 11 to 20 feet (3 to 6 m) in diameter and in depth to 5 feet (1.5 m); some had firepits. Artifacts included stone flakes, choppers, manos, and large, stemmed and corner-notched dart points probably used with atlatls (spear throwers).

Muddy River Phase (Basketmaker III, A.D. 500-700). At this time, the Virgin people began making grayware pottery, but otherwise life seems to have changed little from the previous 500 years. A number of Muddy River phase sites are known from the Moapa Valley; these suggest population growth at this time. People continued to live in pithouses, which in general were smaller and more shallow than those of the preceding phase (Shutler 1961). Of the pithouses excavated, about half had hearths and contained a plaster-lined pit, presumably for storing food. Basketmaker III style dart points found beneath rock overhangs in the Virgin and Muddy River valleys (Shutler 1961: 67) suggest that these, too, were used as shelter.

Lost City Phase (Basketmaker III-Pueblo II, A.D. 700-1100). Sites of this phase show an "astonishing diversity" (Shutler 1961: 14). Clusters of pithouses, rows of above-ground rooms, and pithouse-room combinations are found. People lived or stored goods in either kind of structure (Shutler 1961: 14-16). The pottery suggests that sites from this phase were occupied fairly continuously for four centuries. Long occupancy of sites is also shown by deep deposits of trash in courtyards and by abundant evidence of remodeling. The largest Lost City phase ruin studied by Harrington (1927b: 268) had been rebuilt at least twice.

Pithouses were mostly circular or oval, but D-shaped and roughly rectangular examples have been found. They varied in diameter from about 5 to over 15 feet (1.5 to 5 m) and in depth from a few inches to over 3 feet (1 m). Pithouses were found in clusters of four to 41, scattered widely and interspersed with small storage pits; some of the pithouses had firepits (Shutler 1961: 15). Above-ground rooms were built of adobe, of a rock-and-adobe mixture, or of wattle-and-daub. Harrington felt that they had developed from shallow pithouses during this period. Pueblo rooms were arranged in curving lines; larger sites boasted several lines of rooms around two or more plazas. Such sites had about 8 to 30 rooms, though one had over 100 (Shutler 1961: 15).

Mesa House Phase (Early Pueblo III, A.D. 1100-1150). This short phase is the last in the Virgin sequence and was defined by the appearance of Pueblo III style pottery at Mesa House ruin (Harrington and others 1930; Shutler 1961). Harrington felt that the number of pueblos decreased during this phase, which may mean that abandonment of the area began before 1150.

At the end of this phase, the Virgin Branch disappeared; perhaps the people retired eastward like their neighbors on the Arizona Strip, the Kayenta Anasazi. Why this occurred is still a mystery. Some archeologists feel that Paiute Indians may have driven the Anasazi out. Many late Virgin sites also include Paiute pottery, and in one case a Virgin Branch child was buried with one Virgin and one Paiute pot (Shutler 1961: 29-30). Presumably these show that the Virgin and Paiute people lived side by side for a while or at least traded with each other. Later, however, the relationship may have become hostile, and, if so, the Paiute emerged as the sole residents of Virgin territory.

Other archeologists see the Paiute as expanding to fill a vacuum left by the Virgin people. At about 1150 A.D., a drought occurred in the Southwest (see Dean and Robinson 1977), and at that time, many parts of the Southwest were abandoned. Perhaps the Anasazi, as farmers, were unable to withstand drought, whereas the Paiute with their emphasis on gathering wild foods were more flexible under such conditions. The truth is, however, that the fate of the Virgin Anasazi is as much a mystery today as their origin.

Southern Paiute

The Southern Paiute probably spread into the Great Basin and Colorado Plateau country from eastern California in a movement that began at about 1000 A.D. and continued until historic times (Madsen 1975). As is often the case in the prehistoric Southwest, the reasons for this migration are unknown.

Reed (1949) has described Paiute sites in the Moapa and Virgin valleys as "numerous" and "marked by extensive areas along the southern slopes of sand dunes." These areas were littered with broken firestones, chipped stone (including arrow points), hammerstones, and brownware pottery. Test pits in the sites showed Paiute material as deep as 3 feet (1 m) below the present ground surface, suggesting that Paiute use of the sites lasted for quite some time. Trade continued in this period, as shown by sherds of Lower Colorado Buff Ware in southeastern Nevada sites (Shutler 1961: 8) and fragments of a Jeddito Black-on-yellow bowl, from the Hopi area, in Whitmore Canyon (near Shivwits Plateau) (Baldwin 1942b).

The Southern Paiute, however, are best known from historical and ethnographic accounts (Kelly 1964; Euler 1966a; Fowler and Fowler 1971). These accounts reveal how adept the Paiutes were at surviving under harsh environmental conditions. Small family-sized groups moved to different areas on a seasonal basis as wild foods became available. (Families were in turn organized into small territorial bands, those at Lake Mead being the Shivwits, Moapa, Las Vegas, and Chemehuevi [Kelly 1934].) Most important of the wild foods was pinyon nuts, harvested in the mountains and high plateaus in the fall or early winter. Other important foods were agave, mesquite beans, seeds of grasses, and the seeds and greens of leafy annuals. Hunting concentrated on small animals such as rabbits, which were often hunted communally. On occasion, though, deer or bighorn sheep were brought in.

Some groups supplemented this diet with foods grown in small garden plots along permanent streams or close to springs. As early as 1776, Escalante reported farming among the Paiute, which suggests that they learned this practice in prehistoric times from Pueblo groups (Euler 1966a). Still, this practice did not supply a large part of their diet.

According to Kelly (1967: 6-21), the Paiute camped near sources of water. Powell reported that although they returned to the same spring or stream every year, they usually chose a different spot to camp at (Fowler and Fowler 1971: 53). If this were indeed the case, sparsely littered but extensive campsites would result.

The Southern Paiute made a crude brown pottery, decorated at times with fingernail marks; as one archeologist put it, it is pottery "only a mother could love." Without it, however, Paiute sites are difficult to identify. Although the Paiute made a fairly distinctive side-notched arrow point, wood foreshafts were sometimes used instead, and not all Paiute sites contain such points. Ground stone was plain and was sometimes obtained from archeological sites (Kelly 1964: 37). Most other material goods were perishable. Shelters were crude brush structures; the only sign of these after a few years might be cleared areas or rock rings. Evidence of hearths might also disappear, as fires were small and were built on the ground, rather than in pits. In short, identifying a Paiute campsite is sometimes a puzzle because so little of it survives through the ages. When Paiute pottery does appear on sites, its diagnostic value more than compensates for its homeliness.

The first historic mention of Paiute comes from the Escalante expedition in 1776. Later, the overland route from Santa Fe to Los Angeles followed the Virgin River through Paiute territory. The Spanish (and later, Mexicans) had little direct contact with the Paiute; the real effect of these colonists came through their demand for Indian slaves. The Paiute were a favorite target for Ute Indians and other raiders, who sold their captives in the California and New Mexico slave markets. Malouf and Malouf (1945: 384) suggest that these raids forced the Paiute to camp away from sources of water, in hope of escaping detection. Raiding may have affected the Paiute way of life in other ways as well and may partially explain their "scattered" settlement pattern.

The Paiute had their first sustained contact with European cultures around 1850. Two years before that date, the California land rush had started. Most of the emigrants used a northern route (the Overland Trail), but a few did use the Old Spanish

Trail. These individuals merely passed through Paiute territory, and contact with the natives was usually sporadic. By 1850, however, Mormons began entering southwestern Utah with the express purpose of founding settlements and "civilizing" the Indians.

Given the popular attitudes of their day, the Mormons were fairly enlightened in their treatment of the Paiute. The Mormons worked to convert them and teach them Anglo skills and customs. However, by encouraging the abandonment of native traditions and by their mere presence, the Mormons effectively destroyed the old Paiute way of life. Grasses and other native food sources were destroyed by cattle herds; begging and occasional jobs at Mormon towns supplanted seasonal gathering activities. At the same time, the Paiute suffered from European diseases as did every other New World group. By 1890 they had moved onto reservations or near towns, and the Anglo takeover of the old lands was complete.

Cerbat-Pai

In historic times, the region of the lower Colorado River was occupied by speakers of Yuman languages. One of these groups, the Pai (Hualapai and Havasupai), lived in the basin and range country of northwestern Arizona and on the plateau and canyon country south of the Colorado River. The origin and spread of the Pai has been documented by Dobyns (1956) and Euler (1958), who established a link between the Pai and a prehistoric culture called the Cerbat Branch. Their work, done for Indian land claims cases, shows the Cerbat Branch originating in the desert country west of Grand Wash Cliffs. The earliest date for the Cerbat comes from Willow Beach, where Tizon Brown Ware is found during the Roaring Rapids phase, or before 750 A.D. (Schroeder 1961: 98).

At about 1150 A.D., the Cerbat moved onto the Colorado Plateau. A short time before, this same area had been abandoned by a Pueblo-like group, the Cohonina, or perhaps the Cerbats had pushed them out. In any case, the Cerbat continued to live in northwestern Arizona until the 19th century, when (as the Pai) they were forced onto reservations by the military. Throughout this time, Euler (1966a) feels, Cerbat culture showed a remarkable stability.

The extent of Cerbat culture is fairly well known as a result of land claims research (for a map of historic Pai band distribution, see Dobyns and Euler 1970: 17). Dobyns (1956) analyzed sherd collections from sites in northwestern Arizona--including a number at Lake Mead--and noted the distribution of Tizon Brown and other pottery wares. He concluded (1956: 336-339) that in the Lake Mohave area the Cerbat territorial boundary ran along the crest of the mountains just east of the Colorado River. The strip of land between these mountains and the river was controlled by the Mohave but was also visited by the Cerbat. In the Lake Mead area, Cerbat territory extended to the Colorado.

Historically, the Pai relied mostly on wild plant and animal foods. Farming was done at springs but was limited. Both upland and desert areas were used; people moved from one to the other as specific foods came into season. The preferred location for a base camp was a rockshelter near a spring; temporary camps contained brush shelters that often incorporated the living branch of a tree. Traces of historic Hualapai camps include rock-circle structure outlines (Euler 1958).

Trade was prominent from prehistoric to historic times. A salt sample recovered from a Hualapai rockshelter in Mohawk Canyon (outside the Lake Mead area) proved, upon testing, to be from the Virgin River sources (Euler 1954). This had either been gathered by Hualapai travelers or had been traded to them by Paiute. The Pai traded a good deal with the Hopi to the east and with the Mohave to the west (Kroeber 1935; 164-167; Ruppert 1976: 68-69).

The Pai present an interesting parallel to the Paiute (though linguistically they are not related) (Ruppert 1976: 67-68). Both are cultures that spread from the desert into the higher country of the Colorado Plateau around 1150 A.D. Both replaced sedentary cultures and managed to survive where the earlier cultures had not. In each case, the people practiced some agriculture but basically were hunters and gatherers who moved about seasonally in their search for wild foods, and in each case they lived in small, family-sized camps. However, there is one important difference: whereas the Southern Paiute never acted concertedly, the Pai (according to Dobyns and Euler 1970) had a latent social order that crosscut band allegiances in times of trouble. The Pai were enemies of the Yavapai, linguistic cousins who lived in the central mountains of Arizona, and in wartime Pai bands united under a common leader to fight the enemy. The United States Army discovered this aspect of Pai social organization the hard way, and it took three years of bitter fighting (1866-1869) to defeat the Pai. The process of usurping their aboriginal territory took several more years, but by 1871 the portion of their land around Lake Mead was effectively restricted to Anglo use.

Amacava-Mohave

Along the lower Colorado River, from Cottonwood Island south to the Colorado delta, lived another group of Yuman speakers who made Lower Colorado Buff Ware. Their way of life differed greatly from that of the linguistically related Pai to the east and from that of the Southern Paiute to the north. Until a hundred years ago, the latter groups were hunters and gatherers who practiced a little farming. The Mohave, on the other hand, relied on farm products for half of their food (Castetter and Bell 1951: 74). Like other groups at Lake Mead, however, they also hunted and gathered wild products. Land used for farming and collecting was owned by individuals or groups. During the winter, the Mohave lived in semi-subterranean mud-and-pole houses; in the summer, ramada-like shelters made with poles and brush provided shade. Villages were made up of organized scatters of such structures (Smith 1966). Roasting pits were also common.

The Mohave are believed to have descended from the Amacava. According to Schroeder's (1961: 94) terminology, the Amacava were a branch of the Laquish (riverine) stem of the Hakataya (Yuman) root. (Some workers prefer the term lowland Patayan, originally used by Colton [1945: 120], rather than Hakataya.) Archeological evidence of the Willow Beach sites at Lake Mead dates the earliest

Amacava use of this area to at least A.D. 900. Schroeder (1961) assumes the early Amacava were hunters, food gatherers, and traders who roamed the area between the Mohave Desert and the Colorado River. Willow Beach was interpreted as being a trading spot and was considered the northernmost site of the Amacava. By 1100 A.D., the Amacava apparently moved south and southeast into the lower Colorado River valley proper. Why the Amacava took up farming is unclear, but by the time of the earliest historic accounts (Alarcon in 1540), farming was a mainstay of their subsistence practices.

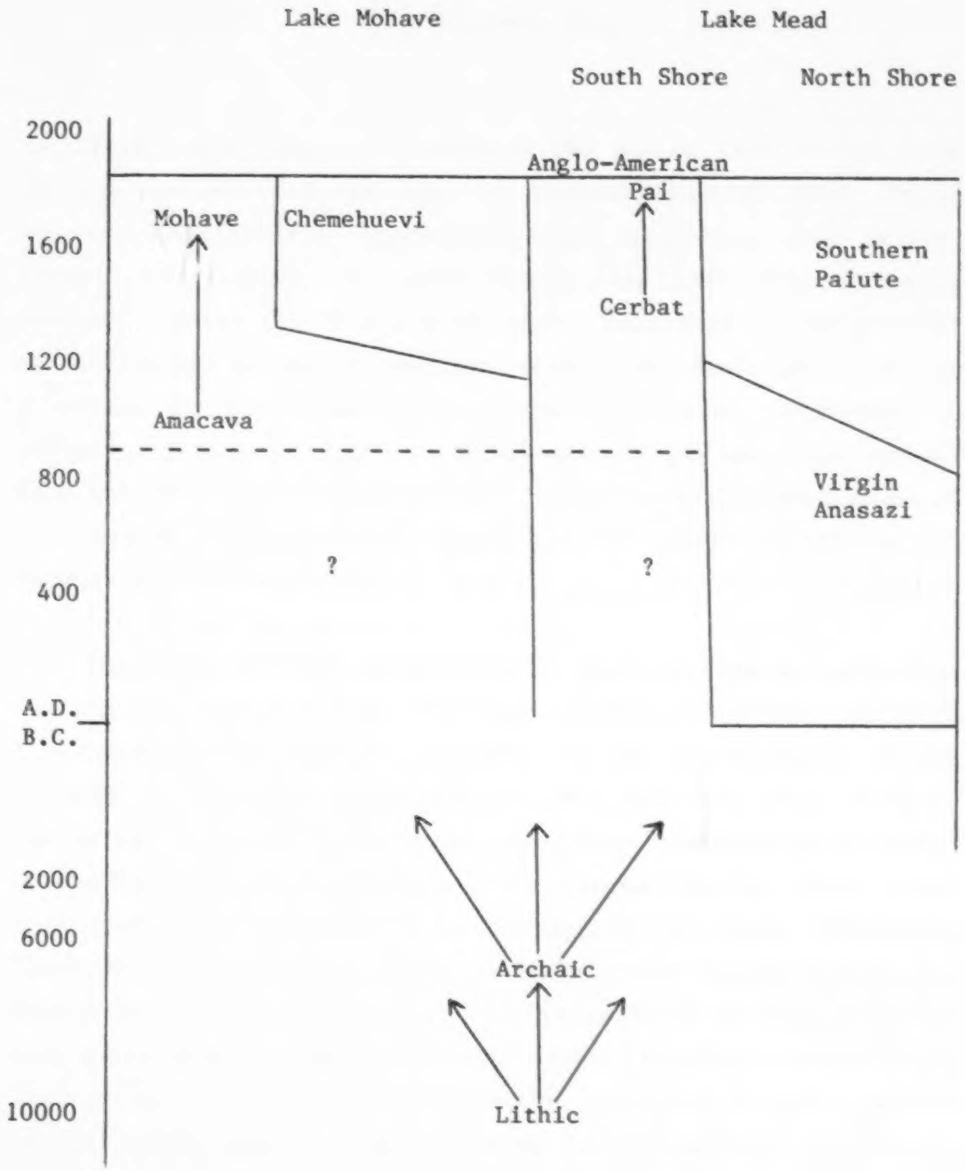
Historically, the Mohave grew maize, tepary beans, pumpkins, gourds, tobacco, and sunflowers, as well as Spanish-introduced wheat, barley, melons, and cowpeas. They also encouraged the growth of wild seed plants (Castetter and Bell 1951). The wide flood plain of the Mohave Valley was ideal for farming as the floods of spring and early summer annually renewed the soil. Canals were not built, probably because they would have been destroyed by the floods. The main planting took place in midsummer, following the receding of the floodwaters, after which time the summer rains provided necessary moisture. In the winter, small plots were also planted on higher ground; they were kept alive by pot irrigation.

Farm products were supplemented by wild plants and animals (Kroeber 1935; Castetter and Bell 1951; Smith 1966). Women ranged far to gather mesquite beans, the most important wild food collected by the Mohave. One variety was harvested in late June, the other in August. These were dried and ground into flour for cakes and dough, which could be stored or used during travel. An intoxicant was also made from the beans. A number of wild seeds were dried and ground into flour, boiled, eaten raw, or made into beverages. Roots, tubers, greens, and fruits were also gathered.

Hunting, of lesser importance to the Mohave than to other groups in the area, was done in parties of 10 to 12 men, who used bows and arrows for larger game, like deer and mountain sheep, and curved throwing sticks or nets for rabbits, an important source of food. Small game was hunted all year round while larger animals were hunted during the winter (Smith 1966; Stewart 1947a, 1957; Castetter and Bell 1951). The Mohave hunted many small animals besides rabbits, some only for their skins. Quail, ducks, and mudhen were eaten while other birds provided feathers (Stewart 1947a). Fishing, which supplied 10 to 15 percent of the Mohave's diet (Stewart 1957: 198), took place during the flood season and after floods when fish were trapped in pools of water. Nets, scoops, weirs, barrel cactus fishhooks and line, and bows and arrows were all used to catch fish.

Continuing an Amacava tradition, the Mohave traveled extensively, going west to the Pacific Coast, north beyond the Shivwits Plateau, east to Hopi country, and south to the Gulf of California. Most of their trade was east-west, with groups that exploited different resources. For example, the Mohave traded farm goods to the Hualapai for wild products and through the Pai reached the Hopi. The Mohave also traveled to fight their traditional enemies, the Maricopa, Halchidoma, and Cocopah, and there was sporadic fighting with the Chemehuevi and other Southern Paiute bands, the Diegueno, and the Pima. On the other hand, they had alliances with the Yuma, Havasupai, Hualapai, and Yavapai (Ruppert 1976), though it seems that even the best of allies occasionally found reason to skirmish.

The Mohave, like the other tribes of the area, finally yielded not to traditional enemies but to the Europeans who flooded into the Southwest after the Civil War. As the Indians were pushed onto reservations, the archeological record begins to reflect cultural and technological patterns of an entirely new way of life. The history of this new occupation is the subject of the next chapter.


Lake Mohave
Lake Mead
South Shore
North Shore
2000
1600
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800
400
A.D.
B.C.
2000
6000
10000
Anglo-American
Mohave
Chemehuevi
Pai
Cerbat
Southern Paiute
Amacava
Virgin Anasazi
?
?
Archaic
Lithic

Figure 12. Cultural relationships in the Lake Mead area.

Chapter 6

EUROPEAN OCCUPATION

by

Mike Belshaw, Ph.D.

This brief chapter encompasses the period from the earliest known penetration of the area by Europeans through 1928. It is not an administrative history of the recreation area itself, though, for purposes of completeness, some post-1928 references are made. Areal limits are those of the Lake Mead National Recreation Area and generally, but not exclusively, deal with lands not submerged by the lakes. In several instances, references to places or incidents that took place outside the Lake Mead boundaries are necessary for continuity. (For a detailed description of this period, including full citations, the reader is referred to Belshaw and Peplow 1978.)

The first recorded penetration of the Lake Mead National Recreation Area took place in 1826 when Jedediah Smith led a group of fur trappers down the Virgin River and the Black Canyon of the Colorado on their way to California. The following year, James O. Pattie was a member of a larger group that included Ewing Young, George Yount, and Thomas Smith, who became "Pegleg" Smith later that year as the result of a skirmish in the Rocky Mountains. Three of this party were killed by Indians near Spencer Creek, and Pattie and his group left for eastern parts by a route that may have taken them through the Arizona Strip. Despite a demonstrated lack of courtesy on the part of Mohave and other Indians, the especially rich furs of the area drew Pattie, both of the Smiths, and others to return to the area for several years.

Later exploration was motivated by quite different reasons and came from all directions. In 1851 westward continental expansion brought Captain Lorenzo Sitgreaves to explore what later became the rail-highway corridor through northern Arizona. Francois Xavier Aubry, a trader of French extraction, was in 1853 not only the first to travel to the area from California but also the first to discover the gold that seduced later argonauts. Both of these parties crossed the Colorado in the vicinity of Eldorado Canyon. Overland surveys of an official nature were also conducted by Lt. A. M. Whipple (1853), Lt. Edward Beale (camel corps, 1857), and Lt. Joseph Ives (1858). A direct result of this exploration was the attempted passage through the area by a group of emigrant wagon trains in 1858. They were attacked by Mohave, and one family was wiped out. This did little to encourage others to follow, and the availability of easier trade routes to the north and south isolated the Lake Mead area from significant interstate or interregional travel.

An important thrust from the south began in 1857 when George A. Johnson in the General Jesep and Lt. Ives in the Explorer both reached Black Canyon. Although the poorly constructed Explorer had some difficulty disengaging itself from a rock in the canyon, both the feasibility and hazards of river navigation were sufficiently demonstrated to encourage the later establishment of Callville as a river port. Indeed, until about 1910, heavy freight could only reach the Eldorado Canyon and Searchlight Mines by river, and bullion from the mills was shipped downstream to ocean-going vessels in the Sea of Cortez. Such freight included the huge mine timbers, machinery, railroad track, and locomotives the industry required. Salt, feed, and foodstuffs could come overland by wagon from the Moapa Valley, Kingman, and elsewhere.

A strong thrust from the north was simultaneous with that from the south. The Mormons, driven to establish their state of Deseret, desired access to the sea by way of the lower Colorado so that their brethren might gather more easily in the Great Basin. Tension with "the States" and rumors of an army invasion from the south induced Jacob Hamblin to reconnoiter the river and, upon seeing Ives' Explorer in the vicinity of Cottonwood Canyon, to send Thales Haskell on board as a spy. He was not convinced that the expedition's intentions were peaceful, and the Mormons mounted another expedition the next year (1858) to search for a defensive site, which proved unneeded.

Concurrent with these explorations, argonauts, possibly on the rebound from California, came drifting through, and although Aubry's discovery was made in 1855, prospectors were reported by Sitgreaves as early as 1851. The first claim was the Honest Miner in Eldorado Canyon, where gold had been found in 1859 by soldiers sent to quiet the Mohave. By 1865 a minor boom was under way, and the canyon population had reached perhaps 1500. Little evidence of this and later booms remains in the recreation area since the most productive mines, such as the Techatticup, lie to the west of the Lake Mead boundary. The docks and millsite are under Lake Mohave, and disastrous flash floods have obliterated much physical evidence.

Mining activity has a periodicity determined not only by the accidents of mineral discovery but also by prices and technological advances throughout the world. Mineral deposition is the result of several processes either singly or in combination. The hydraulic action of rivers, streams, and floods can deposit minerals, notably gold, in the alluvium of streambeds. There it might be discovered and subjected to placer extraction. Or the alluvium may be compressed into conglomerates, which call for hard-rock extraction techniques. In other circumstances, a gneiss or other metamorphic rock may hold the minerals. Mineral deposition may have followed structural weaknesses from the deep, which, if persistent through several deposition cycles, may yield a commerically viable concentration at the surface. All these processes were evident within the boundaries of the recreation area, but the tortured terrain yielded only one mine of substance--the Katherine. Other evidence of the prospectors' hard scrabble scratching can be found in any of several forms--a prospect; a shaft; a tunnel; mine workings, such as head frames; processing evidence, such as sorting chutes, tipples, cyanide tanks, or stamp mill foundations; or campsite evidence in the form of litter, a cabin, or a mine tunnel adapted for living.

Prospects, as the term implies, are exploratory holes that are often little more than slight depressions in the surface. The author identified about 52 prospects in the recreation area but suspects that this underestimates the true number by a factor of three or four. Shafts are usually rectangular holes sunk into the earth at an angle of between 60 and 90 degrees. Access is by ladder, a tripod hoist, or a head frame, with a cable and pulley used to extract ore-bearing rock. If the shaft is inclined, wood or metal rails may guide a wheeled ore carrier. Shafts should not be confused with stopes. These represent ore-bearing veins, which are worked up from below. Occasionally, as in the Eureka Mine, these stopes broach the surface and are exposed to view. Adits or tunnels are cut horizontally either directly into ore-bearing material or with the intention of intercepting it. Deeper adits may require rail lines and associated tipples or loading chutes. Hazards such as rotten timbers, unseen shafts, rattlesnakes, or unstable dynamite abound in these locations, and great care should be taken before they are investigated.

Exogenously determined prices affected the ebb and flow of mining activities, with booms (especially in industrial metals, such as copper) affected by wars and closings associated with recessions and depressions. Gold and silver, because of their monetary implications, are peculiarly associated with legislation and decree, and their prices are affected by monetization and metallic standard policies. These metals, together with uranium and salt, are the major minerals found within the recreation area.

Because the ore is usually of low value content, industrial metals generally are worked in large deposits and require capital, intensive production, and a large corporation with access to financial reserves. Such conditions did not exist within the recreation area. However, a copper mine with some historical continuity was developed at Copper Mountain in the extreme eastern end of the area. This remote, inaccessible location, apparently first worked around the turn of the century, could only be exploited be-

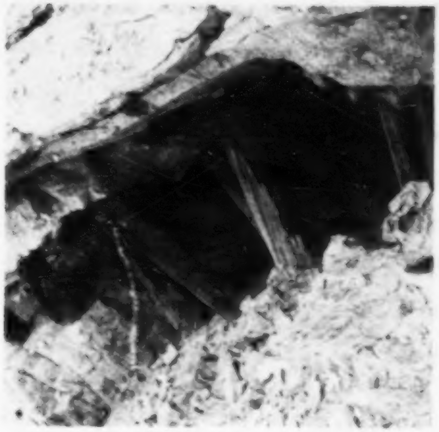

Fig. 13 Exposed stope at Eureka mine, showing careful timbering.

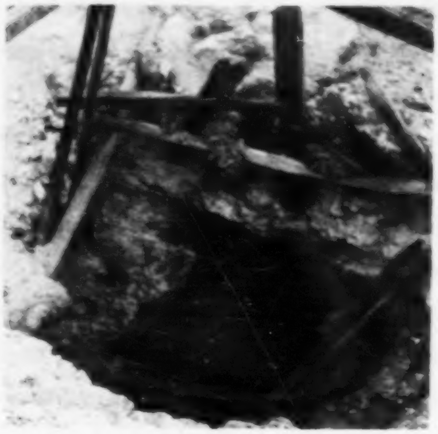

Fig. 14 Mine shaft, typical of many at Lake Mead. Now in poor condition.

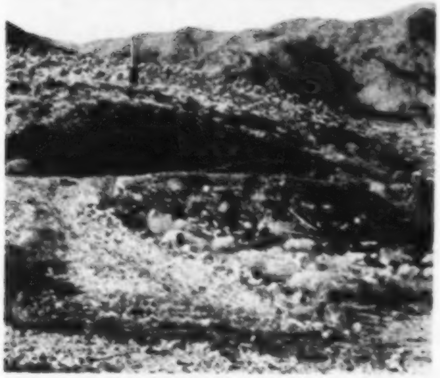

Fig. 15 Hard scrabble: lodging in a tunnel. Note flue protruding from ground above the tunnel.

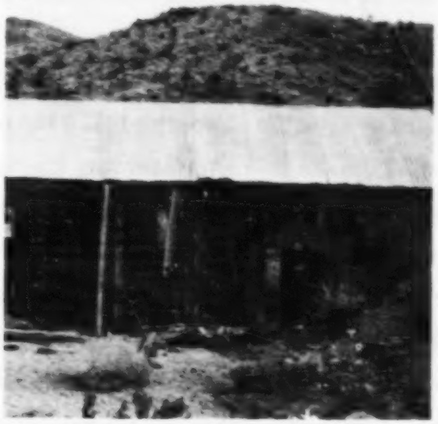

Fig. 16 Miner's bunkhouse. This represents the luxurious end of the range at Lake Mead. Gutters suggest an attempt to capture and store rainwater.

cause of the exceptionally high copper content of the ore, which was enhanced by gold, silver, and, after World War II, uranium. The ore was originally packed out through Andrus Canyon on burros and then transferred to horse-drawn wagons for a haul of over 70 miles to St. Thomas.

Technological developments, particularly the cyanide process, which was introduced to Arizona in 1895, allowed some mines, such as the Empire, to function in situations where the transportation of ore to mill sites would be prohibitive. But ore processing, either by cyanide leaching or by stamp mill pulverizing, required water, which is noteworthy for its poor distribution. Of all the mine sites checked, only the White Rock was near a live stream. However, rusted pipes, boilers, water towers, and old tanks suggest that active springs may have existed at one time in a number of locations.

Sporadic mining took place throughout the prehistoric and historic periods and continues to this day. Accounts of travel and reports of artifacts suggest Spanish or Mexican activity in the area surrounding what is now Lake Mohave prior to 1859. Indigenous mining of turquoise in the same general region, near Boulder City, and in the proximity of the Old Pope and Cohenour mines is also reported. The salt mines on the Virgin River were an important objective of Jedediah Smith in 1826 and 1827. Salt and turquoise were apparently prehistoric trade items, and, during the historic period, salt was transported by wagons to the mines at Eldorado Canyon and the cattle operations on the Shivwits Plateau. The mines were submerged by Lake Mead in 1938, but a salt quarry remains above water and may show evidence of early use.

In a few cases, there is some likelihood that families accompanied men to the mines. At the Golden Mine, for instance, there are children's toys and clear indications of efforts to make the camp attractive and livable. It is, nevertheless, safe to generalize that life was hard, lonely, dangerous, and the rewards few. As already noted, adequate water for mining, stock, and culinary purposes was meager and not distributed conveniently to the deposits. The bleak, primeval isolation of the sites has to be experienced to be understood. Such an environment offered virtually nothing for sustenance in a modern context, and all needed goods had to be imported. Fire from stoves and explosions of dynamite could maim or kill far from help. Not the least of the hazards was from renegade Indians, such as Mouse, Queho, or Toab. Queho's depredations continued into the 20th century. After shooting his victims, usually miners, he bludgeoned them with a miner's pick and resupplied his larder from theirs.

Two further points should be made with regard to mining. Although the output of the scattered mines was individually small, they were often part of mining districts, such as Eldorado, Salt Springs, Katherine, and Gold Butte, and collectively could support a custom mill such as that at Katherine. As ores petered out or prices fell, it is likely that most sites were occupied for a short time. Secondly, some mines did not seem to have been able to support the processing facilities associated with them--the Homestake, for instance. Such may be examples of deliberately inflated operations designed to lure Eastern monies to the fabulous West and then, of course, to separate coin from client.

Elsewhere in the West, the intense, if brief, mining activity frequently generated a settlement that, in due and rapid course, left a ghost town behind to scatter in the dust. Not so at Lake Mead, where the only ghost town was spawned by agriculture and then suffered two deaths, one from taxes and the other from drowning. St. Thomas, near the confluence of the Virgin and Muddy Rivers, was established in 1865 in Pah-Ute County, Arizona, of which it became the country seat. The Mormon settlers built homes, their church, businesses, and cleared and planted the land. In 1870, to their dismay, the settlers found that a survey had placed their village in Nevada and that Nevada demanded not only back taxes but payment of these taxes in gold. This, for an agricultural settlement, was a cruel blow, and with the consent of Brigham Young, all but one of the families joined the exodus. By 1877 a return migration began, and some 2000 persons eventually were in residence, only to have disaster strike a second time. On June 11, 1938, the waters of Lake Mead entered the town. Five days later, the postmaster hurled the cancellation stamp from the post office window, and St. Thomas was abandoned for the last time.

In terms of population, Callville and Rioville were lesser settlements than St. Thomas, and their sites too were inundated. Callville was established in 1864 as a link in the chain of settlements that would give the Mormon Zion its projected outlet to the Pacific. Callville's location was based on the rather shaky assumption of river navigability to that point, and despite the construction of a warehouse, dwellings, and a road to St. George, as well as funding by the Deseret Mercantile Association and support from the church, Callville was abandoned in 1869.

The one family who remained in St. Thomas in 1871 was that of Daniel Bonelli, who saw that the mines below Black Canyon would be in need of foodstuffs and salt and that an overland route would require the establishment of a ferry. This he proceeded to do at the confluence of the Virgin and the Colorado. The ferry allowed him to transport salt, feed, and foodstuffs, much of which he produced on his farms in St. Thomas and Rioville, to the mines of Eldorado. Paddle-wheel river boats could also reach Rioville once ringbolts had been secured, allowing them to be winched up Roaring Rapids in Black Canyon. When railroads diverted traffic and upriver farmers diverted the Virgin River waters that Bonelli relied on for irrigation, the small settlement began to wither, and the post office, established there in 1881, closed in 1906.

Although no transcontinental trails intersected the forbidding terrain of the recreation area, a number of locally and regionally significant emigrant and freight roads passed through the area. One, of course, is that linking the Bonelli Ferry at Rioville with Moapa Valley to the north and mining centers to the south. The trail's northern extension to St. Thomas is submerged. To the south, the main branch apparently slogged up Detrital Wash and over a mountain range to descend to the river a mile or two north of Eldorado Canyon. A possible east branch winds around

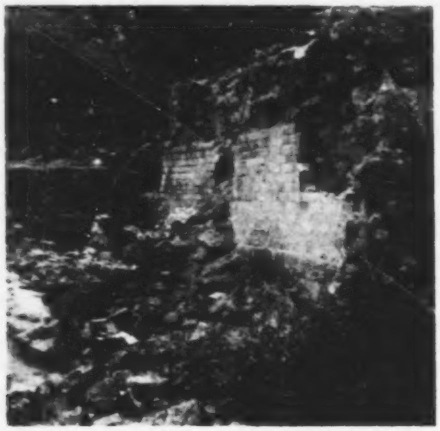

Fig. 17 Homestake Mine, foundations for boiler. Bricks in this structure were imported from Los Angeles.

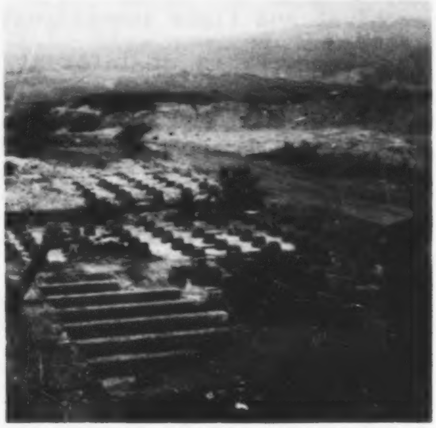

Fig. 18 Katherine Mill Site, foundations for cyanide vats. This was the most successful mining venture within the recreation area.

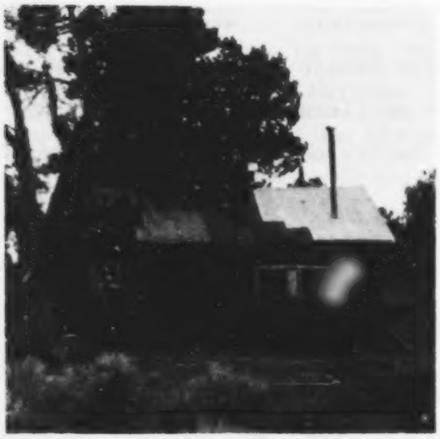

Fig. 19 Horse Valley Ranch, main building. A pristine example of a pre-mechanization ranch (Shivwits Plateau).

Fig. 20 Corral on the Shivwits Plateau at Green Springs.

Temple Bar to the mines at Salt Spring and perhaps to Truxton. Further identification of both these southern extensions requires archival and field investigation.

Two ferries of interest, Gregg's and Scanlon's, were located in what is now called Gregg's Basin. They served, for the most part, the travelers who passed from the Gold Butte mines in Nevada to other mines south of the river. Access from the north was discouraged by difficult terrain, and the dugway constructed by Scanlon was so hazardous that it hardly improved the situation. The one major event at this site occurred in 1893, when a Utah cattleman by the name of Preston Nutter acquired 5000 steers in Arizona and had them swum across the river at this point without a single loss of man or animal.

Although it was in operation only from 1876 to 1883, Pearce Ferry is perhaps the best known of the early river crossings. The first crossing at the site was made in 1863 by Jacob Hamblin, who was then on his way to the Moqui villages. Official church correspondence indicates that a ferry crossing and wagon road were contemplated at that time to allow travelers to avoid the hazards of Navajo country. Treaties with the Navajo solved this problem, but Mormon need for access to their settlements on the upper Little Colorado and to the Salt River Valley encouraged them to seek alternatives to Lee's Ferry.

A number of problems plagued the ferry established by Harrison Pearce and eventually led to its abandonment. The Colorado River as it disgorged from the Grand Canyon was treacherous and unpredictable, and travelers sometimes had to backtrack all the way to Rioville. The road itself, constructed up Mokiac Canyon out of St. George, down Grand Wash, up Tassi Wash, and over to Snap Wash, was extremely rough and lacking in reliable forage and water. Traces of this road remain, and occasional debris marks its path. Its exact alignment is not fully known, and research on this is warranted.

Because of its contribution to the off-season economy of St. Thomas and the number of leading families involved in freighting upon it, the freight road from Grand Gulch Mine to St. Thomas is of great local historical significance. The Grand Gulch Copper Mine, first located in 1873, became viable about the turn of the century, when a railroad from Salt Lake City reached the Moapa Valley and good copper prices stimulated production. Initially the one-way wagon haul was 140 miles but was reduced to 45 miles when the St. Thomas spur was constructed. After the fall harvests were in, St. Thomas farmers would hitch their wagons to teams of from six to 20 horses or mules and string out along the trail as it wound through sand dunes, across the Virgin River, up Bitter Wash, across to Grand Wash, and up Grand Gulch to the mine. Hazards and hardships were common, and scattered trail debris can still be seen. Highway 91 follows one branch of the trail for a short way, and though the trail was used little by wagons, some wagon parts mix with automotive relics as well as campsites along this segment. This trail saw heavy use from about 1900 until the end of World War I, after which time work at Grand Gulch continued only sporadically. It should be noted that this same trail extended beyond the Grand Gulch Mine to Andrus Spring, where wagons were hauled to pick up ore that had been packed out from the Copper Mountain Mine by burros. Some traffic to the Copper Mountain Mine made a long detour through Hidden Canyon in order to avoid the tough climb through Grand Gulch.

Although nearly all of the land in the recreation area is used for grazing, only two ranch headquarters, Tassi and Horse Valley, were established. Tassi is an oasis in the forbidding desert of Grand Wash, and, as such, was an important historic and prehistoric node. Early travelers on their way to Pearce Ferry encountered Indians there and traded with them. Although a claim was filed upon the waters in 1903 by members of the Nay family, they apparently did not take up residence. Neither did Sam Gentry, who made an informal claim on the waters in 1912. The first non-Indian resident, reported to be Ed Thomas in the decade of the teens, apparently built a cabin, the only remnant of which is a concrete pad. Present structures at the site are recent, having been built by Ed and Wayne Yates in 1938. Tassi was used in the intervening years as a base from which Sam Gentry, the Englestead brothers, and others ran cattle and sheep. Isolation of this kind is often an attraction to the lawless. Queho haunted it, and bank robbers cornered Ed Yates there. Its most colorful episode was during Prohibition when the Hecklethorne brothers combined a little sly cattle rustling with a moonshine venture. When the inevitable raid occurred, they and their colleagues made expeditious use of Pearce Ferry.

The Shivwits Plateau division of the recreation area is far removed in space, elevation, ambience, and historical continuity from the division that embraces the two lakes. At elevations ranging from 6000 to 7000 feet, the environment is one of snow and rain, ponderosa and pinyon, sage and grass. It is ideal for ranching except for the unreliability of water. But it is also one of the most remote areas in the lower 48, and even today, one can be a hundred miles from the nearest paved road.

It is for this reason that penetration and exploitation of the plateau were late. The first penetration, that of Dunn and the Howland brothers (to be discussed below) took place in 1869 and was both fortuitous and tragic. Ten years later, a ranch was established at Oak Grove (outside the Lake Mead area) by the Canaan Cooperative Cattle Company, which operated under the philosophy of the United Order then being promoted by the Mormon Church. This, the Parashaunt Ranch, was first managed by B. F. Saunders, and it produced beef, pork, and dairy products for St. George and the struggling Grand Gulch Mine. Saunders located water sources, such as Log Spring and Green Spring, and developed them. His were the first cattle to drift down the Shivwits peninsula into what became the recreation area. Other cattlemen followed, to claim by usufruct the land and its few waters. Most were from St. George, and the situation appeared relatively harmonious until the aforementioned Preston Nutter burst on the scene in 1893.

On his way to Strawberry, Utah, with the cattle he had acquired below the Colorado, Nutter's gigantic herd was caught by winter snows in Fort Pierce Wash near St. George. He recognized the potential of the Arizona Strip range and decided to exploit it. This he did with such vigor as to earn the undying enmity of the less aggressive St. George cattlemen. His main tactic was to acquire title to the springs, seeps, water pockets, and tanks, which he is said to have done using Civil War scrip purchased in Washington, D.C. Since water is the key to the control of arid lands, Nutter soon dominated the Strip from the Hurricane Fault to the Grand Wash Cliffs. His dominion included the Kelley Peninsula, but no record has been found of his claim on its principal waters, Green and Ambush Water Pockets. Later recorded claims on these suggest the possibility that he bluffed others into believing that he controlled the water rights. He did build a fence across the peninsula, below which he ran steers. Elsewhere in the Strip his operation was mainly cow-calf. A large and decaying picket corral near the cross fence was probably built by Nutter.

For a short time, 1908 to 1916, much of the area in question was under the jurisdiction of the Dixie National Forest. In 1916 the Parashaunt Division of the forest was restored to the public domain and opened for homesteading. The number of persons who filed homesteads appears to be small, and of those who filed and proved up, even less. Only a handful filed, proved up, and survived. One of these was "Slim" Waring, who came to Arizona from New York in 1912, worked for a while at the Vulture Mine near Wickenberg, then crossed Gregg's Ferry to file in Horse Valley "because nobody was there." He built a cabin and, with Bill Shanley, branded maverick steers below the cross fence. This, according to local folklore, affronted the powerful Preston Nutter, who arranged to have Waring drafted and sent overseas. Nutter's hold was constantly being challenged, and he hired outlaws from the outside to protect his interests. One of these was Ed Johnson, who was involved in several incidents of gunplay in the Strip and who eventually came to a violent end that some informants feel was not accidental. Johnson, in connivance with Nutter, homesteaded a section of land outside the present recreation area near the Wildcat Ranch. This section was later deeded to Nutter. While in Nutter's employ, Johnson built a brush fence around a pasture claimed by Waring. Waring promptly set it on fire, and Johnson searched him out, gun on pommel. Fortunately for Waring, they did not cross paths.

Waring eventually gained control over most of the peninsula. This he did by buying out those few who homesteaded, by acquiring sections that had been granted to the Santa Fe Railroad, and by filing on waters not claimed by others. He built the ranch headquarters at Horse Valley. The large cabin, several outbuildings, a corral, and several tanks offer a glimpse into the 19th and early 20th centuries when one could not yet take for granted electricity and the internal combustion engine. In 1942, the Wildcat Ranch became available, and Waring transferred his headquarters to that location. In 1978, after 62 years in the area, Waring continues to run cattle on the peninsula, but now under permit from the National Park Service, which has acquired his ranch.

The history of the Colorado River in the Grand Canyon has its share of controversies that, never likely to be resolved, will tease the contentious proclivities of historians for years to come. One of these relates to the fate of O. G. and Seneca Howland and William Dunn, who, for reasons not universally agreed upon, left John Wesley Powell at Separation Rapids on August 28, 1869. All that is known of their fate is that, within a few days, they had climbed to the plateau, there to be murdered by Shivwits Paiute Indians. Even this account is not universally accepted. One contemporary authority has attempted to lay the blame for their deaths on Mormons in general and on Jacob Hamblin in particular. This is somewhat unlikely since Hamblin was traveling from Santa Clara to Kanab at the time of their deaths.

Frederick Dellenbaugh, whose loyalty to Powell was exceptional, claimed that the men were killed at Ambush Water Pockets, whereas some local informants place it far to the north in the Parashaunt area. Considerable analysis has yet to be done to verify or discount certain of the claims and speculations in this matter. A likely chain of events, based upon analysis contained in the full report (Belshaw and Peplow 1978) and a trek out Separation Canyon by the author, would be as follows:

Dunn and the Howland brothers left the river early in the morning on August 28. By noon they had reached the East Fork of Separation Canyon after passing up the West Fork as unpromising. They also passed the East Fork since its heading to the southeast would appear to carry them away from their northerly objective. This was a mistake. The main canyons were boxed in, and they returned to the East Fork around sundown. They followed the East Fork the next day, finding a few pockets of water from summer rains, but no targets for their guns. By late that day they reached the esplanade, after having had great difficulty finding a way out. The next day (August 30) they scrambled up a canyon (as yet unnamed) to the north and bushwhacked their way to the top of Blue Mountain. From there another higher mountain (Mount Dellenbaugh) could be seen to the north, and with a compass, a route could be traced to avoid canyons cutting into the peninsula from its sides.

Weakened by thirst and hunger, they took two more days to reach the base of the distant mountain. They had found some water in what became known later as Ambush Water Pockets and Green Springs, and, perhaps, in the sagebrush meadows a rabbit or two had been shot. Not enough, though, to rebuild their waning strength.

Early next morning (September 2), Dunn, perhaps having more residual strength than his companions, left them to reconnoiter the mountain. When he finally heaved himself onto the black rimrock, he saw a small lake two miles to the north and, between low hills, a gap leading in the direction of the Mormon settlement in Utah. Partly from the reflex of a professional explorer, and partly in case he became separated from his companions, he hastily scratched his name, the date, the word WATER, and an arrow pointing to the lake, upon the basalt. He rejoined the brothers; they refreshed themselves at the lake and followed the gap north. It proved to be a dry water course. In the afternoon, they stumbled upon a band of about 30 Indians camped by a flowing spring. Both groups were probably alarmed and mistrustful, but the men were fed and tried to recoup their strength. During the night, members of the band, covetous of the men's guns and few belongings, joined in their murder. Five days later, word of the killing reached Salt Lake City by Indian courier and the Deseret Telegraph. It was a full year before members of the band were interrogated by white men, Powell and Hamblin at Mt. Trumbull, by which time all evidence had disappeared, thus to confuse the issues and confound the historians.

Chapter 7

RESEARCH PROBLEMS

In Chapter 8 we recommend a five percent archeological survey at Lake Mead. The results of the proposed survey will provide a basis of planning and site monitoring in heavily used parts of Lake Mead and for interpreting cultural resources in the area as a whole. To accomplish this, it is necessary to record all cultural resources in sampled areas, to judge their significance and value for research, to determine whether they merit nomination to the National Register of Historic Places, and to make recommendations for their management. These goals are consistent with Executive Order 11593 and the National Historic Preservation Act.

The key to achieving the above goals is evaluating the significance of cultural remains, and one way to do this is to determine sites' eligibility for nomination to the National Register. According to 36 CFR 800, any resources that have yielded, or are likely to yield, information important in prehistory or history are eligible for nomination to the Register if they are at least 50 years old. Conceivably, this may include all cultural resources found by a survey, no matter how limited; even isolated artifacts have a contribution to make. Scovill, Gordon, and Anderson (1972) also have discussed the concept of social values of resources as a measure of their significance. From one aspect of this approach, cultural remains must be evaluated in light of how they can be used to solve current archeological problems. This parallels the National Register criterion of yielding information important to prehistory or history. In a research design for Lake Mead, we have defined four broad archeological problem areas, specifically: (1) Culture History--who occupied the area, and when did they occupy it? (2) Site Function--what were sites used for? (3) Site Distribution--are site type locations predictable? (4) Human adaptation to arid lands.

In the following discussion, specific questions are asked within each of the problem areas.

Culture History

As indicated in Chapters 5 and 6 of this report, the culture history of Lake Mead is poorly known. The early, Lithic and Archaic, stages are the least understood. If people occupied the Lake Mead area during the earlier of the two, their remains were probably part of a chipped stone tradition called the San Dieguito. The first definite occupation was probably by Archaic peoples, as inferred from the presence of points stylistically dated from archeological finds elsewhere in the Southwest. Even the ceramic period cultures are poorly known; their chronology is based on traded pottery rather than on tree-ring dates, carbon-14 dating, or other absolute dating methods. Very few Southern Paiute, Pai, or Mohave sites have been studied; most of what we know of them comes from ethnohistoric and ethnographic accounts that are conflicting. As might be expected, the period of European occupation is best known, though few sites of this period have been adequately studied, and there are no written accounts of many of the types of remains found in the area. In sum, much of the area's culture history is based on dates derived from other parts of the Southwest and on incomplete or inaccurate studies. As a result, a number of basic questions still need to be answered before we can interpret the culture history of Lake Mead from an archeological point of view. The questions we have asked with respect to culture history are basically, "Who occupied the area, and when did they do so?" These questions can be asked of each group thought or known to have lived in the Lake Mead area and can be expanded upon to interpret the archeological data the area contains.

Lithic Stage. Is there any archeological evidence for a San Dieguito or other Lithic stage occupation? Where did this culture develop, and how did it relate to other early cultures to the east? Was this tradition derived from cultures in the Northwest, and what was its specific adaptation? How can tools from this period be separated from those of later periods? Are there diagnostic tools (such as points) dating to this period? Is the lack of ground stone truly a hallmark of this culture, and, if so, what does it imply? Are heavy patination, varnish, and associations with old landforms valid techniques for dating? Are there stratified deposits containing San Dieguito materials at Lake Mead?

Archaic Stage. What is the evidence for Archaic occupation? Is it a local development? Did it develop before, at the same time as, out of, or following a Lithic stage? Is the Archaic at Lake Mead a desert adaptation? How are Archaic remains related to traditional classifications like "Amargosa" or "Pinto Basin?" Are these categories relevant to the remains found? Given the length of the Archaic in the Southwest (several thousand years), what changes, if any, are evident in this period? To what are these changes related? Are the point typologies usually considered diagnostic of this stage valid? What tools are associated with these points, and can they be distinguished from tools of earlier or later periods? Can patination and varnish be used to date Archaic remains? Are there stratified deposits at Lake Mead that contain Archaic remains? Is it valid to use biotic data, such as areas of plant diversity, to identify open Archaic sites? Was ground stone introduced during this time? Is there reason to believe this implies significant changes in plant exploitation? Did some Archaic groups develop into ceramic cultures while others remained unchanged for thousands of years? Is the Shoshonean analogy valid for the Archaic?

Virgin Anasazi. Did the Virgin Anasazi culture develop from local Archaic groups? How close was the relationship with the Kayenta Anasazi to the east? Why did the Virgin Anasazi farm in such marginal country? Did greater dependence on farming result in increased sedentism? How much did the old way of life, particularly hunting and gathering, continue? What is the validity of development phases proposed for the Virgin Branch? Are there Virgin Anasazi deposits at Lake Mead that can be dated by tree rings, carbon-14, or other techniques of absolute dating? Did the popu-

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lation increase in Basketmaker III and continue in Pueblo II times, and was this followed by a decrease in population in early Pueblo III times and abandonment by 1150? Did the Virgin Anasazi move to the east or intermingle with Paiute populations? If they abandoned the area, was drought or Paiute movements the cause? What other factors were involved?

Southern Paiute. If one assumes the Southern Paiute are a separate group from the Anasazi, when did they move in, and did the two occupations overlap? Were the Paiute a factor in Anasazi abandonment? If drought was the cause of the Anasazi abandonment, why were the Paiute able to survive whereas the Anasazi could not? Did the Paiute move into this area from the southwestern Great Basin 1000 years ago and, if so, why? Did the Paiute farm prehistorically? When did they begin making pottery? Did they borrow these ideas from Pueblo neighbors? Are there ways to identify a Paiute site when it lacks diagnostic pottery? Are there differences between Great Basin and Colorado Plateau Shoshonean adaptations?

Cerbat-Pai. Is the link between Cerbat and Pai valid? Where did the Cerbat come from? Has the Cerbat-Pai living pattern been as stable through time as thought? Why did the Pai have more group cohesion than the Southern Paiute, with whom they shared a similar lifestyle? Without Tizon Brown Ware, can a Cerbat-Pai site be identified?

Amacava-Mohave. Is the link between the Amacava and Mohave valid? Did the Amacava move into the Colorado River area from the Colorado Desert? If so, when? Is this when they became more sedentary and began farming? Whom did they replace? Are there sites at Lake Mead that could help clarify the Lower Colorado Buff Ware typology? Did the Mohave and Pai trade because each had different goods to offer? How much trade was there among the Mohave, Pai, and Paiute? Why were the Mohave the most active traders of these peoples? Were relations friendly or hostile among these groups, and did relations often change?

European. When did European contact with the Paiute, Pai, and Mohave begin? What were the effects of indirect and direct contacts? How did reactions differ among groups? How much had aboriginal lifeways changed before ethnohistoric and ethnographic accounts were written? Can archeological data from Lake Mead be used to check these accounts? What was the extent of European occupation of the area? How long did individual endeavors last, and if they were abandoned, why? Was European occupation successful in comparison to that of Indians? Would Europeans have used the area to a greater extent than they do today if the lakes had not been formed?

In trying to answer these questions, the survey will need to identify as many diagnostic materials as possible, especially pottery and point styles; however, independent dating is still needed for remains in this area. For this, locating stratified deposits is necessary as they can provide datable remains, such as charcoal, wood, obsidian, bone, and shell, and serve as a check on established pottery and point sequences. In addition, we need to investigate the reliability of methods that provide relative dates --patination, varnish, associations with environmental features (old landforms, diversified plant communities). A single date from a site may not yield much information, but a series of dates from dozens of sites would provide means to judge chronologies now in use.

Site Function

From past research, we can describe the types of cultural remains found at Lake Mead. Problems arise in interpreting what functions were actually served by sites. The classification of site types we have used is itself one interpreation of site function. By far the most common remains at Lake Mead, both on the plateau and in the desert, are scatters of chipped stone. These range from isolated finds to scatters covering several miles. Most of these scatters have been interpreted as quarries and chipping stations where chippable stone was found and initially prepared. However, other activities probably also took place. Isolated points and sherds, along with used and modified chipped stone, suggest that hunting, collecting, and tool making also took place in these areas. Although the exact nature and extent of these activities needs to be better defined, such sites are often referred to as limited-activity sites. The survey should test the function of such lithic scatters and relate them to other site types and regional settlement patterns, which also need to be identified. Furthermore, there is a need to identify variations in stone tool making and to correlate differences with specific cultures or periods of time. For this, detailed analysis by lithic specialists is needed.

In the recreation area, aboriginal living sites range in type from temporary campsites to base camps to villages. (These are, of course, our interpretations.) Here again, the range of activities at these sites, how they differ from each other, and why they are located where they are needs to be defined better. A temporary camp, by its nature, is likely to leave few traces. Can such camps be identified by careful analysis of associated artifacts, separating camping activities from others, such as quarrying? Were base camps seasonally occupied and returned to year after year? Were they centrally located to take advantage of various resources? After needed goods were obtained, were tasks completed at the base camps? Were village sites occupied seasonally or year round? How often did people have to leave their villages to get needed resources, and how far did they range? Did life at village sites differ substantially from that at base camps?

Special recording techniques are needed for some features of aboriginal sites, such as rock circles, rock piles, trails, petroglyphs, and pictographs. As these features are particularly hard to interpret and date, careful analysis of associated artifacts and features, if any, is necessary. For one thing, such studies are needed to differentiate modern rock features and trails (including those made by animals) from ancient ones. Studies on the effects of weathering (varnish, patination, or fading) and geological process (such as the formation of desert pavement) would also be useful.

Recording procedures for all of these sites must be worked out in advance so that consistent data are available for tests of function. This means more than just finding a label for sites; rather, sites should be related to patterns of settlement and resource use.

The archeologist has some advantage in dealing with European sites because they are similar to modern American culture and because of written records. However, with increased technology, the variability in remains is likely to exceed the knowledge of individual workers. Again, data collecton must be consistent and directed toward solving problems of site function. To achieve this, the specialized knowledge of historians is required.

Site Distribution

At the present time, the Western Archeological Center is setting up a master file of all clearances, surveys, survey site forms, and site cards for Lake Mead. Thus far, we have been able to locate more than 800 sites recorded within the recreation area boundaries. (Since the file is not yet complete, an exact figure cannot be given.) It is difficult to estimate how many sites there are at Lake Mead, but certainly there are thousands. At present we can do no more than offer hypotheses about site distribution at Lake Mead. Most past research has been directed to short-term needs and goals rather than to a comprehensive view of the area's archeology, and our predictions of site distribution must be tested by further study, including the proposed five percent survey. Most early research concentrated on sites along the rivers, and some survey has been done on the plateau. Since the lakes have been formed, clearance work along their margins has resulted in some study of low-lying desert areas. The mountains have received little attention; thus, we can do little to predict what can be found there. With the information we have now, sites used by the various aboriginal groups who occupied the area can tentatively be discussed in relation to three obvious topographic zones: along rivers, on the plateau, and on the desert bajadas. The desert mountains are not discussed because we know so little about settlement patterns there. Certain aboriginal sites do not seem to be restricted to specific zones, and thus their locations are harder to predict. These sites, as well as the historic European sites, are discussed separately.

Along Rivers. Who used the rivers and for what reasons? Along the lower Colorado River, what appear to be the oldest sites in the recreational area have been tentatively identified as San Dieguito. If these claims are valid and no other San Dieguito remains are found elsewhere in the area, does this show that these early people were adapted to non-desert environments? The only evidence for use by the next culture group, Archaic peoples, along the rivers has been at the Willow Beach site, interpreted as a trading site. What other uses Archaic peoples made of the rivers are not known. We do, however, have good evidence for intensive use of the rivers by the later Virgin Anasazi, Paiute, and Amacava-Mohave peoples. Their villages were built along the Muddy and lower Colorado Rivers where fields could be irrigated or watered by annual floods. This settlement pattern continues along rivers outside the Lake Mead boundaries. Many of the Virgin Anasazi village sites in the recreation area are now under water though some of them are above the current lake level. Whether or not villages were built along the lower Virgin River is not known. The Mohave built their villages along the lower Colorado where floods have destroyed or covered much of the archeological evidence. If any of these village sites remain at Lake Mead, they too are now under water.

Other acitivites besides farming are suggested by the Willow Beach site. Can the trade interpretation be verified, and do similar sites exist? Some Amacava-Mohave and Paiute campsites have been recorded along the rivers; however, because earlier studies usually passed over less substantial sites, we have little information on the extent to which these rivers were used for limited activities--quarrying, hunting, gathering wild foods, travel--and camping. The remaining unflooded portions of the rivers should be carefully studied to identify stratified deposits and to determine the extent of occupation and the full range of activities along their banks.

On the Plateau. Earliest use of the plateau is suggested by isolated finds of Archaic points. Besides hunting, we do not know what Archaic peoples were doing there. Heavy use by Virgin Anasazi and, later, by Paiute groups is obvious. A few crude pueblo-like sites have been found on the Shivwits Plateau. Do these sites indicate that dry farming was possible there, or were they used in the same way as base camps, which are common on the plateau? Such camps often include remains of one or more structures. Other shelter may have been provided by brush structures that left little or no archeological evidence. These camps seem to be most common in the wooded areas, and the main permanent sources of water, springs, are often several miles away or are far below in the canyons. Did these people farm small plots at springs? How much did they depend on wild plants and animals found on the plateau? Most of the base camps were in the open; sometimes rock overhangs below the plateau rim were lived in or used for storage or camping. The pueblo-like villages and base camps on the plateau are surrounded by limited-use sites. There are large quarry areas and chipping stations, and there is evidence of hunting and plant collecting activities. Roasting pits are common on the plateau, on the esplanade, and along the drainages.

On Desert Bajadas. When Lakes Mead and Mohave were formed, they covered the flood plain and terraces of the rivers, and their margins now cut across bajadas. Until recently, these low-lying desert areas had received little attention since they usually contain only limited-use sites. Because such sites generally lack stratified deposits and contain few diagnostic sherds and points, it is very difficult to determine who used individual sites. There is no clear indication that early cultures used these areas though there are hints of Archaic use. We do know that all of the groups after the Archaic used these areas, but the extent of that use is unknown. How their use of these areas fits in with river and plateau settlement patterns is also not clear. What are found are quarry areas and chipping stations, and it appears some hunting and plant gathering also took place. Although archeological evidence is scant, there was some farming done at springs. Temporary campsites have been found, but whether people ever lived there on a more permanent basis is not known.

Other Sites. As already mentioned, the locations of certain kinds of sites are particularly hard to predict. For instance, the location of temporary camps is hard to predict because these were probably chosen without much forethought while en route from one place to another or while collecting a specific resource. This is further complicated by the fact that limited activity sites, associated with the acquisition of particular resources, are found throughout Lake Mead. However, accessibility seems to be an important factor affecting site location and resource use. For instance, it seems logical that trails would follow the easiest routes from one area to another and be used while collecting needed resources and for trade and seasonal movements. These routes and their uses still need to be identified. Such a study would be easier if aerial photographs were used and followed by field checks. Discarded artifacts, shrines, rock features, and temporary camps along trails may be found. The location of petroglyphs and pictographs is also very hard to predict though they are often found on large boulders or cliff faces in mountains or canyons.

Historic Sites. Even with historic documents, predicting the location of European settlements is not easy. In fact, we have even less archeological data on historic sites than on prehistoric sites at Lake Mead, and written records rarely describe the commonplace activities carried on there. Most historic European settlements are associated with farming, ranching, mining, and travel. Who were the people who lived there, and how long were they there? What were the ties between the different activities and settlement patterns? We expect less variety in site types (especially limited-use sites) as these people, by importing many goods, lived off the land less than the Indians had. At this point, it is easiest to discuss European occupation by activity rather than by location.

European farmers took over the flood plains once farmed by Indians where fairly plentiful irrigation water could be diverted. Whether they attempted farming away from the rivers is not known. It is interesting to note that modern ranchers on the plateau grow grain for livestock feed, apparently by rainfall alone. Settlements occurred in farming areas or at ferry and steamboat landings to take advantage of the trade on or across the Colorado River. Of course, like their prehistoric counterparts, these sites are now under water.

Although ranching also took place near rivers, less water is needed for raising livestock than for irrigation farming; thus, the distribution of ranches and related sites is less easy to predict. Presumably, however, they are located where water can be controlled and contained. Ranching sites are found on the plateau, in deep canyons, and in the desert. In areas where the water supply is meager, ranch sites can be expected at springs or in locations central to several springs. Features for controlling livestock, such as fences and corrals, are built for a variety of reasons, and thus their locations are hard to predict.

Presumably mines are located where ore can be reached; many are in the canyons and mountains. However, associated milling or living sites are not always at the mines and may be located with respect to other resources, such as travel routes or water. As a result, the locations of these may be easier to predict than those of mines.

Many of the roads and trails used by Europeans probably followed routes that had been used by Indians for thousands of years. These should be fairly easy to identify as maps are probably available, and some land modification was often necessary to accommodate the traffic. Here again, aerial photographs would provide useful information.

In sum, it must be remembered that the above statements do not cover all possible prehistoric and historic settlement patterns and that they require testing. The history of Lake Mead occupation is long and is complicated by many factors. In land as arid as this one, the importance of one factor, water, cannot be underestimated; however, it appears that only large-scale farming was limited by the distribution of water. In general, it appears that water was just one resource among many that affected the settlement and subsistence patterns of the people who lived there. Like other goods, it could be collected and transported for various uses at working and living sites.

Human Adaptation to Arid Lands

For several thousand years, the Lake Mead area has witnessed human beings coping with life in an arid environment. If the archeological record of the area could be deciphered and explained, it could have direct applications to the problems in the world today.

Around the world, about 630 million people live in arid lands (Eckholm and Brown 1977: 5), many of them using primitive technologies. Batisse estimates that some 60 countries around the world are partly or wholly in arid regions, and, as he notes, "All traditional forms of arid-land use show fragility" (1969: 5). In some places, population growth and abuse of the environment are leading to the spread of deserts (le Houerou 1976); in others, the effects of climate changes regularly push local populations to starvation. The most dramatic recent case of this is the Sahel of Africa, where, following a drought, developed nations are spending millions of dollars to provide adaptive stability to native farmers and herders (Bernus 1977). The problem of life in marginal areas is not restricted to such "primitive" societies. Eckholm and Brown (1977: 14-15) claim that in the United States, 50 million acres of Bureau of Land Management land are degraded to the point that they support only a small fraction of their original capacity.

The goal of this part of the research design is to understand how people adapted or failed to adapt to the arid environment of Lake Mead. Part of this effort involves identification of prehistoric patterns that seem linked to successful adaptation and those which correspond to unsuccessful adaptation. Since historic European sites are part of the area's cultural resources, aboriginal and modern uses of the area can be contrasted.

Archeologists may scoff at the thought that "primitive" cultures have anything to offer to a space-age world. However, many Third World countries have found that because Western technology demands more capital and natural resources than they can muster, its solutions may be unrealistic. For example, Amiran (1977), in discussing possible uses of arid lands, dismisses grazing, dry farming, and terrace and qanat agriculture as socially undesirable. He argues, instead, for activities such as tourism, industry, and greenhouse farming (1977: 13-15). Clearly he presumes that materials and fossil fuels are abundant and cheap, as he suggests (p. 15) cloud-seeding is a "most significant contribution" to arid-land agriculture. A Third World subsistence farmer may find these solutions less inspiring than a simple explanation of check-dam agriculture. As reserves of oil are used up, low-energy strategies such as those practiced by prehistoric Southwesterners may gain new luster for even our own industrialized society.

Specific problems in adaptation to an arid environment related to the archeology of Lake Mead include the use of natural resources (especially water), settlement patterns, coping with drought, and the problems of overpopulation.

Use of Natural Resources. Lake Mead archeology reflects the full range of human approaches to land. The Archaic period is one of hunting and gathering of wild foods. The period that follows is one that characterizes many "primitive" cultures today: various mixtures of farming, hunting, and gathering of wild plants. Historic sites represent the introduction of livestock and plow farming and the use of European technology (pre- and post-internal-combustion machine) to exploit non-renewable resources. Finally, the lakes themselves demonstrate the concept of sacrificing huge areas of land for limited, intensive economic activities--flood control and production of electricity.

The earliest inhabitants seem to have been self-sufficient. In contrast, when archeologists go into the field at Lake Mead, they take along truckloads of supplies--food, water, gasoline, gear, and sometimes even firewood. Clearly, technology affects the way local resources are used. The perspective can be reversed; different technologies may prove to be more or less appropriate for a desert environment like the one at Lake Mead. Specific questions we can ask are:

1. How do levels of technology, such as hunting and gathering, horticulture, and industry, affect land use in this area?

2. How does each of these strategies succeed or fail in terms of attaining adaptive stability over time?

Euler and Chandler note, for example, that the Pai and Paiute were able to live in the Grand Canyon area after it was abandoned by the Anasazi and Cohonina. They hypothesize (1978: 84) that this was due to differences in adaptive strategies. Therefore, differences in Pai/Paiute and Anasazi/Cohonina adaptations may give a clue as to which factors are important in providing adaptive stability for this part of the Southwest. In another vein, it can be suggested that desert peoples achieve long-range stability only by maintaining economic ties with less arid regions. Fontana notes that desert Papago often worked as harvesters on riverine Pima farms in exchange for food (1974: 516). The effect of such relationships on cultural stability in arid lands certainly deserves consideration.

Water. Farming, herding, and simple existence are impossible without water, but modern approaches to its use in deserts are not always well thought out. For example, dam construction can disrupt local economies and spread water-borne diseases (Stanley and Alpers 1975). In the Sahel of Africa, the use of mechanically drilled deep wells has encouraged grazing in certain areas until they have become denuded (Bernus 1977).

The archeological record is, in a sense, a filing cabinet of ideas on how to use water in deserts. The classic study by Evenari and others (1970) found ancient runoff-control features used for farming in the Negev and rebuilt them for modern use. The Lake Mead survey should note different ways in which water was used in order to add to the list of strategies that can be tried in arid lands, specifically:

1. What kinds of water resources are present, how were they used, and what were they used for?

2. If there are water resources that were not used, what are these, and why were they not used?

3. The usual modern solution to water needs is pumping of ground water or drawing water from permanent streams. These solutions create problems of their own, for example, when water tables drop due to excessive pumping. On the basis of answers to 1 and 2, what methods can be suggested that do not directly affect ground water or permanent streams? What strategies are suggested that are low-energy and affordable by developing countries?

Settlement Patterns. Settlement patterns vary greatly in desert areas, and the cause for this variation is poorly understood. According to Foss (1970: 165), the population of arid regions may be roughly divided into two major categories--a diffused and scattered population living in the hinterlands and a concentrated population living in oases. Foss characterizes areas of sparse population as ones of conservatism and population stability or decline while he sees oases as areas of rapid population growth and innovation.

At Lake Mead, a great deal of variation exists. In the lower Muddy River valley, where a permanent stream permitted irrigation of bottomlands, knolls are dotted with sites of the Virgin Anasazi (Shutler 1961). On the Shivwits Plateau, water sources are small, isolated springs, seeps, and water pockets. There, sites of the same culture are scattered and are often several miles away from or thousands of feet above the sources of water (Teague and

McClellan 1978: 177-178). The differences are obviously related to the nature of local water supplies, but other factors also seem to operate. Understanding the relation of settlement patterns to other aspects of human life in the desert might prove useful to Third World planners who find themselves dealing with those patterns. Specific questions that can be asked about settlement patterns are:

1. How do the distribution and use of water affect settlement patterns?

2. What factors, besides water, affect settlement patterns at Lake Mead? What are the different settlement patterns for different periods and cultures? Why do these differ?

3. Are there characteristics which distinguish "stable" settlement patterns from "unstable" ones? Why, at Lake Mead, would one pattern be more "stable" than another?

Drought. In many ways, the problem with arid lands is not that water is scarce, but that its supply is unpredictable. In places like the Sahel, farms and herds are built up in "good" or "wet" years, only to be destroyed during drought. Droughts might be easier to cope with if they could be predicted, but at present this is impossible. Another help is to understand how people have coped with drought in the past.

The Southwest is a unique laboratory for this problem. Tree-ring dating has resulted in both a cultural sequence and a climatic sequence that--by archeological standards--are well-defined. The "great abandonment" of Pueblo sites just before 1300 A.D. was once explained in terms of a prolonged drought (Douglass 1929). Similarly, Pueblo abandonment of several areas, including Lake Mead, may be related to drought at about 1150 A.D. (Dean and Robinson 1977). There have been droughts throughout the history of the Southwest, however, so the problem becomes one of understanding why some droughts caused abandonments and others did not. Invoking drought as a catastrophic event explains very little, but considering it in relation to adaptive strategies may prove useful.

1. What evidence is there for droughts at Lake Mead?

2. How did these droughts affect local peoples? Were adaptive strategies changed in response to such droughts? What different back-up resources were available during droughts?

3. Is it possible to describe certain strategies as more "drought-resistant" than others?

One crucial limitation of the Lake Mead data is the lack of a local tree-ring sequence, so climatic information will have to be extrapolated from the areas immediately to the east. Clearly, it would be useful if the survey attempted to locate materials for such a sequence.

Overpopulation. Overpopulation is a world-wide problem, of course, but is especially distressing in arid lands. There, traditional land use seems more or less adapted to local conditions if and when that use is in moderate amounts. However, as population increases, often the same techniques are used more and more intensively until the land is made waste.

In the Southwest, overpopulation has been proposed as a cause of abandonment of sites (Zubrow 1972; Swedlund and Sessions 1976). Although there are great problems in discussing population size for prehistoric groups, it may be a factor in cultural development at Lake Mead and so should at least be considered. We can ask:

1. What evidence of population change through time is there for different cultures? For example, does the frequency of living sites for a given culture change significantly through time?

2. If there is evidence for population growth, how is this reflected in changing resource use, settlement patterns, or abandonment of an area?

3. What are the relative differences in population size for different cultures? Could these differences relate to degrees of stability over time? We can propose, as a formal hypothesis, that in arid environments denser populations are inherently less stable than less dense ones.

4. How do cultural factors affect population density? For example, in well-watered places, agriculture may allow a greater

density of population than hunting and gathering. Other areas, however, are "useless" to farmers, and so density there is lower.

At the moment, many arid land studies focus on desertification, which might be defined as the spread of wastelands due to human abuse. In the prehistoric Southwest, however, overpopulation may have had a very limited (but still important) effect on the environment. Arroyo-cutting, for example, may be enough to make floodwater or irrigation farming impossible, causing the abandonment of otherwise unaffected areas. In order to study overpopulation at Lake Mead, then, it will be necessary to understand how population increases may have affected the local environment. We suspect that the widespread destruction implied in the term "desertification" is not always necessary to make an area, culturally speaking, undesirable.

Summary

The survey design we propose is oriented toward locating and studying sites in heavily used parts of the Lake Mead National Recreation Area. However, it is also designed to provide answers to questions of interest in archeological theory. Two broad problems, culture history and site function, are directly related to evaluating the resources to be found. Prediction of site distribution, dependent on a knowledge of culture history and site function, can be a useful tool in development planning. The fourth problem is not directly related to evaluating specific archeological remains but is just as important; this is the problem of human adaptation to arid lands. What we propose is to use Lake Mead as a laboratory for applied research and to come up with some answers useful to people in arid lands today. The attempt may fail, but archeology does not advance by holding only to the tried and true. If nothing else comes out of the research design, the kinds of information and analysis it requires will probably serve to refine methods and theory in the archeology of the region.

Chapter 8

RESEARCH AND MANAGEMENT RECOMMENDATIONS

Despite a long history of research at Lake Mead, survey coverage has been uneven, and few early reports are useful for planning or management purposes. In 1978 the Western Archeological Center proposed a five percent survey of the recreation area in order to provide information needed under Executive Order 11593. In this chapter we expand on that initial recommendation and specify survey locations and techniques. Since underwater archeology studies already done by the National Park Service proved fruitless, our recommendations cover only those lands that are not inundated. In addition to the five percent survey, other recommendations involve (1) visitor education, (2) consideration of historic sites from an archeological perspective, (3) survey of development areas not covered by the proposed five percent survey, (4) report format, and (5) the Lake Mead site master file. Finally, we summarize the results of this study.

Five Percent Survey

In the suggested survey, we have considered the need to evaluate the effects of recreation area activities on archeological resources and the fact that past research has provided some information on sites at Lake Mead. We suggest the five percent survey be done over a period of four years, during which time adjustments be made in the research design and survey techniques as new information becomes available. We also suggest that many specific decisions regarding the proposed survey be left to the discretion of the project director.

The core of the proposal is an intensive archeological survey of developed and heavily used portions of the Lake Mead area. To date, construction activities in such places have resulted in a series of small clearance surveys, which, because of their size, have contributed little to the solution of regional research problems. If such areas were surveyed as a whole, using a common research base such as that outlined in Chapter 7, archeologists would have a better understanding of the sites. Also, resource managers would no longer need preliminary surveys for individual construction projects in the survey areas. With advance planning, it is possible that sites could be avoided completely.

In addition to construction, visitors' activities are damaging archeological sites (see Maxon 1970; Brooks and others 1977: 107-108). For example, the original survey of the Rogers Spring area in 1971 showed that a rockshelter there was being vandalized (Brooks and Sedgewick 1971: 1-2). Later, the campground nearby was closed to overnight use, and this apparently reduced vandalism at the shelter, as determined by a survey in 1974. The later survey showed, however, that sleeping circles nearby were still being damaged (Brooks and others 1974: 73a, 78). In 1977, further destruction was apparent.

> At Roger Spring [sic.], a recent visit by archeologists demonstrated that since the 1974 survey, the shelter site has been disturbed more than when last photographed. The house circles on the ridge above the shelter site are now almost completely gone. Heavy visitor recreational useage [sic.] has essentially destroyed the evidence of prehistoric occupation of this area (Brooks and others 1977: 108).

This destruction of archeological sites by visitors runs counter to the principle of stewardship that is at the heart of the National Park Service; it is also forbidden by federal law. Preventing such destruction, however, requires a knowledge of the endangered resources and of the ways in which visitor use affects them. This is another reason, we feel, that an assessment survey of Lake Mead should focus on heavily used parts of the recreation area where damage to sites is most common.

Another reason the research should concentrate on developed areas is because a more traditional sample is not appropriate for the recreation area. To begin with, several of the earlier archeological studies of the recreation area, while often inadequate for planning purposes, do give some idea of the nature and distribution of sites. Therefore, certain kinds of information usually expected from an initial survey are already known. (This information has provided a basis for the research design presented in Chapter 7.) Also, the flooding of much of the area by Lakes Mead and Mohave means that no sample, no matter how carefully devised, will include the full range of prehistoric sites or activities.

We propose the following guidelines for the five percent survey:

Sample Design. The survey will cover the areas listed in Table 3. These areas, which receive heavy use, were defined with the help of Jim Vanderford of Lake Mead. They total three percent of the recreational area. An additional one-half percent sample will be surveyed along roads and shorelines in areas not listed in Table 3 in order to study the effects of visitors in or near areas of travel or recreation. The nature and location of this one-half percent sample should be determined by the project director.

The exact nature and location of the final one and one-half percent sample should also be determined by the project director. This sample is necessary because survey of heavily used areas and portions of road and lakeshore locations is not adequate for a general understanding of Lake Mead archeology; it should be used to study areas not covered by the three percent survey to insure that the overall sample is as representative as it can be. The project director may wish to use the funds allocated for this one and one-half percent sample in a variety of ways--for helicopter or boat reconnaissance, for restudying prehistoric and historic sites identified in earlier reports, or for achieving a stratified random sample by placing transects or quadrats in little used and little known portions of the recreation area. For example, the director may wish to resurvey the portions of Lost City within Lake Mead boundaries that have survived or that reappear during times of low water. Belshaw has also suggested that historic European sites located during his study require evaluation by an archeologist.

Table 3

HEAVILY USED AREAS IN LAKE MEAD NATIONAL RECREATION AREA

Area			Acreage Estimated
LAKE MEAD--NORTH SIDE			
Lower Moapa Valley	T16S, R68E, Sec.	19 (within Lake Mead)	385
		20 (within Lake Mead)	160
		28 (above 1200')	600
		29 (above 1200')	600
		30 (within Lake Mead)	115
		31 (within Lake Mead)	80
		32 (within Lake Mead, above 1200')	300
		33 (above 1200')	130
		TOTAL:	2370
Overton Landing	T17S, R68E, Sec.	23 (N½ above 1200')	560
		TOTAL:	560
Rogers Bay	T18S, R67E, Sec.	12 (E½ of SE¼ of SE¼)	20
	T18S, R68E, Sec.	7	640
		8	640
		9 (above 1200')	320
		16 (above 1200')	30
		17 (above 1200')	480
		18	640
		19 (N½ above 1200')	100
		TOTAL:	2870
Echo Bay	T19S, R68E, Sec.	5 (above 1200')	100
		6 (above 1200')	480
		TOTAL:	580
Callville Bay	T21S, R65E, Sec.	3 (W½ above 1200')	80
		4	300
		9 (W½ above 1200')	220
		TOTAL:	600
Las Vegas Wash-North	T21S, R64E, Sec.	7 (S of Overton Rd.)	180
		16 (above 1200')	600
		17 (above 1200')	560
		20 (N of Las Vegas Wash, above 1200')	160
		21 (above 1200')	200
		TOTAL:	1700

Area			Acreage Estimated
LAKE MEAD--NORTH SIDE (cont.)			
Las Vegas Wash to Boulder Bench	In T21S, R64E, the area bounded by a line starting at Lake Mead, running W along 36° 07' 30" to the R64E-R63E boundary; then S to the NE corner of T21S, R63E, Sec. 25; then E to a point due N of the NE corner of T22S, R64E, Sec. 6; then S to a point due E of the NE corner of T21S, R63E, Sec. 36; then E to a point due N of the NE corner of T22S, R64E, Sec. 5; then S to the NE corner of T22S, R64E, Sec. 5; then E to Lake Mead		4280
	T22S, R64E, Sec.	2 (Saddle Island)	220
		3 (above 1200')	600
		4 (E½)	320
		9 (E½)	320
		10 (above 1200')	440
		11 (Saddle Island)	120
		22 (E½; and the SE½ [on a diagonal] of the SW¼)	400
		23 (above 1200')	620
		24 (above 1200')	200
		25	640
		26	640
		27	640
		34 (within Lake Mead)	320
		35 (within Lake Mead)	320
		36 (N½)	320
	T22S, R65E, Sec.	30 (W½)	320
		31 (NW¼)	160
		TOTAL:	10,880
LAKE MEAD--SOUTH SIDE			
Kingman Wash	T31N, R23W, Sec.	35 (above 1200')	240
		36 (above 1200')	600
		TOTAL:	840
Bonelli Landing	T31N, R21E, Sec.	12 (above 1200')	260
		13 (N½)	320
		24 (W½)	320
	T31N, R20E, Sec.	19 (above 1200')	320
		TOTAL:	1220

Area		Acreage Estimated
LAKE MEAD--SOUTH SIDE (cont.)		
Gypsum Bay	The area bounded by 36° 04' 30" on the S; 114° 24' on the E; and Lake Mead on the N and W.	1800
	TOTAL:	1800
Temple Bar	The area bounded by an E-W line running through the NE corner of T30N, R20W, Sec. 1 on the S; 114° 20' on the W; 114° 17' 30" on the E; Lake Mead on the N.	1300
	TOTAL:	1300
Salt Spring Bay	T30N, R18W, Sec. 8 (above 1200')	300
	TOTAL:	300
Hualapai Wash	T30N, R17W, Sec. 4 (W¼)	160
	5 (above 1200')	480
	8 (N¼)	160
	9 (N½ of NW¼)	80
	TOTAL:	880
South Cove	T31N, R17W, Sec. 10 and the area bounded by a line running NW into Lake Mead from the NE corner of T31N, R17W, Sec. 3 on the NE; a line running SW into Lake Mead from the same point on the SE; and Lake Mead to the W (above 1200').	820
	TOTAL:	820
Pierce Ferry	The area bounded by a line running E-W through the NE corner of T31N, R17W, Sec. 1 on the S; an E-W line 1 mile N of that line on the N; a N-S line 1 mile W of 114° 00' on the W; and Lake Mead on the E.	600
	TOTAL:	600
LAKE MOHAVE		
Eldorado Canyon	T26S, R65E, Sec. 3 (S½ above 640')	310
	10 (N¼)	160
	TOTAL:	470

Area			Acreage Estimated
LAKE MOHAVE (cont.)			
Cottonwood Cove	T28S, R65E, Sec.	23	640
		24 (above 640')	100
		TOTAL:	740
Christmas Tree Pass	T31S, R65E, Sec.	10	640
		11	640
		22	640
		23	640
		TOTAL:	2560
Davis Dam	T32S, R66E, Sec.	2 (SE¼; S½ of SW¼)	240
		11 (within Lake Mead)	160
		12 (NW¼ of NW¼)	40
	T21N, R21E, Sec.	5	640
		6	640
		7 (above 640')	500
		8	640
		17 (N½)	320
		18 (N½ above 640')	300
		19 (E½ of SE¼; NW¼ of SW¼; NE¼)	280
		20	640
	T21N, R22W, Sec.	1 (above 640')	120
		12 (above 640')	100
		13 (above 640')	80
	T22N, R21W, Sec.	31	640
	T22N, R22W, Sec.	36 (above 640')	280
		TOTAL:	5620
Upper Cottonwood Valley	T24N, R22W, Sec.	7 (above 640')	250
		8	640
		9	640
		16 (above 640')	560
		17 (above 640')	240
		18 (above 640')	20
		21 (above 640')	160
		TOTAL:	2510
Willow Beach	The area bounded by an E-W line ¼ mile N of 35° 52' 30" on the N; a second E-W line 1 mile S of that latitude on the S; a N-S line 1 mile E of 114° 40' on the E; and a second N-S line ¼ mile W of that		

Area		Acreage Estimated
LAKE MOHAVE (cont.)		
Willow Beach (cont.)	longitude and by the Colorado River on the W.	760
	TOTAL:	760

TOTAL AREA OF SURVEY: 39,880 acres (62.3 sections, equal to 161.4 km^2 or 16,140 hectares).

The structure of any random sample should be left to the project director; however, a few suggestions are made here. Transects can be a useful tool; depending on transect size, a large number of sample units can be spread over a large area, and each sample unit can be restricted to a single environmental zone. However, as one study of the Shivwits Plateau showed (Teague and McClellan 1978), transects are not always useful for site density studies. The authors discovered that on the plateau (and elsewhere at Lake Mead) many sites cover miles of area. Conceivably, several randomly placed transects could cut across different portions of the same site. Transects were appropriate for the purposes of reconnaissance survey, such as the one conducted on the plateau, since they provided information on the types of cultural remains found there. However, it is suggested that further studies on the Shivwits Plateau use quadrats or other areal sample units to provide the kinds of information necessary for understanding intrasite, intersite, and environmental relationships. For the proposed survey, transects would be most appropriate where little or no work has been done, as in mountain areas.

Intensity of Coverage and Boundaries of Survey Units. Survey of sampled areas should be intensive. All archeological remains in each area should be reported so that development planning, archeological clearances, or preparations for salvage programs can be done on the basis of the report without further survey. For convenience, the sample defined in Table 3 is given in terms of arbitrarily defined areas. However, the surveyors may prefer to use natural boundaries, such as drainage channels, to define areas roughly corresponding to the ones presented here.

Monitoring Site Conditions. Survey records should be used to monitor site conditions in the future. All sites should be photographed (with detail shots of architecture), and the points from which the photos are taken should be identified. Quantitative information, such as surface artifact density and degree of erosion or vandalism, should be noted and mapped. If sites are being resurveyed, original site forms and photographs should be compared with the site's present appearance, and the amount of damage in the intervening time should be determined. Selected sites should be revisited on a regular basis, and estimates of the rate of disturbance at such sites be determined. For each site at which human or natural disturbance is taking place, survey crews should identify the origins of the disturbance and make recommendations on how to prevent further damage. For example, if an area is being disturbed because it is easily accessible, how are people reaching the site, and how can access be controlled?

Resurvey of Development Areas Already Partially Surveyed. A small part of the areas in Table 3 has already been surveyed for the Lake Mead development program (Brooks and others 1974). We recommend resurvey of this area for the following reasons:

1. The previous study covered only small portions of the heavily used areas in Table 3; the remaining portions have been studied very slightly, if at all. In some cases, it is not clear what has been surveyed and what has not. One of the recommendations in the survey report (Brooks and others 1974: 80, and throughout the report) is that the development areas be restudied more extensively in the future.

2. Resurvey of site areas covered by the previous work means that new data relevant to the proposed research design will be recorded. Inclusion of previously surveyed areas, small as they are, will not increase the cost of the survey significantly, but their exclusion will result in uneven coverage and will reduce the quality of survey interpretations.

3. Restudy of sites surveyed in 1971-1974 will make possible a preliminary estimate of changes in site conditions during the last decade. This information will be valuable in setting up a site monitoring program.

Areas that Require No Further Study. In some cases, parts of the recreation area are so developed that survey would be a waste of time. Some of these can be located in Brooks and others (1974) or by looking at maps, but others can only be identified in the field. The proportion of such disturbed areas in the three percent sample is small. We suggest that any savings made by not surveying such areas be used to study other places not listed in Table 3 but that are later identified (either by the project or by the recreation area staff) as heavily used or slated for development. In the final report on the proposed survey, areas not surveyed should be distinguished from areas that were surveyed but did not contain any cultural remains.

Recording Historic Sites. The survey should record historic as well as prehistoric remains, including isolated artifacts. It is difficult to suggest a date after which cultural resources should not be considered. The guidelines for National Register nominations (36 CFR 60) include several criteria, among them an age of at least 50 years (which at the time of this writing means 1928). This is the same year that Hoover Dam was authorized and near the time the Great Depression began. Both events signaled a basic change in the way the area was used. Therefore, we feel that all materials dating before 1928 should be recorded. However, there are conditions (36 CFR 60) under which more recent properties are eligible for the National Register, and the survey should be aware of these. Furthermore, information relevant to evaluating the sites or carrying out the research design may postdate 1928, and such information should definitely be noted.

Additional Recommendations

As already mentioned, a number of research and management concerns (in addition to the five percent survey) need to be considered.

Visitor Education. Most visitor damage to sites seems to result from curiosity rather than malice. We hope that a greater effort will be made to inform the public about the scientific and historic value of these sites and the damage that is done when people remove or displace artifacts. Part of this effort should describe the area's prehistory to the public and indicate how archeological research has given us an understanding of the past.

Archeology as History. By tradition, Southwestern archeology has dealt with prehistory, with the result that archeologists and historians have communicated little. Archeology is changing, however, with new emphasis on material culture and its relation to human behavior without constraints of time or space. Historic sites are now seen as a valuable source of social data and can no longer be ignored or treated haphazardly in research designs or project reports. For example, Belshaw and Peplow (1978) note that many of the mines in the area may be the result of a desire to part Eastern investors from their capital rather than of a serious belief in the mineral value of the claims. This may be difficult to document since it is unlikely that such promoters announced their true intentions. However, archeological studies of mines could be used to verify whether or not serious improvements were made to mine claims. It is obvious that study of Lake Mead's cultural resources will benefit if historians and archeologists cooperate in their research.

Other Surveys. If areas not included in the five percent survey require survey or if areas included must be surveyed before the study takes place, we urge that piecemeal surveys be avoided. Whenever possible, it will be useful for Lake Mead managers to define, and request survey for, development zones rather than for restricted construction sites. Survey of the latter might be adequate for clearance purposes, but it is not very useful for either planning or archeological synthesis. A survey of a larger area, though, would be useful for both purposes, even if some of the remains found were not directly affected by proposed actions. If further development occurred in the zones later, planning could be based on the initial survey. Alternatively, small surveys could be done at one time by a single crew so that this work would at least be directed under a single research design; thus, more consistent data would be collected. We recommend that researchers conducting the surveys use the research design given in Chapter 7.

Enough recent survey has been done in desert bajada areas (for example, Brooks and others 1974; Curriden 1977; McClellan and Phillips 1978) that for preliminary planning, at least, sample surveys may be a practical alternative to full coverage. (A discussion of this point is found in Appendix 1 of McClellan and Phillips [1978].) In other areas--mountains, the Shivwits Plateau, or along the Colorado River--the archeology is still poorly known, and full coverage is recommended.

Report Format. Much past research at Lake Mead has been directed toward short-term goals and specific needs rather than toward a comprehensive view of the area's archeology. As already mentioned, a common research orientation would help provide a common focus. Beyond this, however, small-scale projects could make a greater contribution if reports on them followed a common format. Of course, the form and content of a report is often determined by published guidelines (for example, McGimsey and Davis 1977) or by contract specifications. Still, we suggest that future reports on surveys at Lake Mead include the following:

1. A report should discuss the reason for the survey, location and size of the survey area, sampling strategies, survey coverage, recording techniques, collections (if any), and disposition of notes, maps, and collections.

2. Sections on environmental and cultural background should be included. This information gives readers of the report a feel for biases of the researchers.

3. Maps showing the survey area should be based on or correlated with U.S. Geological Survey maps, and Universal Transverse Mercator (UTM) coordinates should be given for each site. To protect sites, publicly distributed copies of the reports should not contain exact locations but should state where authorized persons may find this information.

4. A section relating findings to earlier research or regional problems should be included. If the remains are insufficient to allow this, the report should state that fact.

5. Either the type of information collected on survey should be discussed in the report, or the forms used in recording remains should be appended.

6. Differential treatment of cultural resources should be

noted. Is there an artifact density below which sites or features were not defined? What cutoff date was used and why?

It may seem inefficient to include theoretical sections in a report on small projects, such as a sewerline clearance, but not doing so makes the report less useful to other researchers. At the very least, such a report could state, "We used the theoretical assumptions of . . .," and refer to earlier studies (such as this one), mentioning any points of disagreement. Similarly, the report could conclude, "The meager findings are like those . . ." and make the appropriate citation. In the case of small clearances, the insertion of even one or two paragraphs defining the theoretical background would help make results comparable and useful for larger research efforts.

Lake Mead Site Master File. At the present time, a master file containing clearances, site survey forms, site cards, and maps is being set up at the Western Archeological Center. As further research is conducted at Lake Mead, new information needs to be added to keep the file up-to-date. In addition, there are records and artifacts located at Park Service Headquarters in Boulder City that need to be organized so researchers and managers can have better access to them. The latter endeavor exceeded the time and financial limitations of this project.

Summary

This report has been written to provide a guide for managers and researchers dealing with Lake Mead archeology. Many parts of the report may also be of interest to visitors to the recreation area. A number of federal regulations that affect the management of cultural resources on public lands were summarized in Chapter 2. These call for an inventory of sites and an evaluation of their significance to provide information necessary for balancing the needs of development and preservation. This can best be achieved by viewing the cultural remains in terms of their usefulness in solving research problems. We defined research problems relevant to this area only after the quality of previous information was evaluated and gaps in our knowledge identified. A synthesis of what we know is given in Chapters 3, 4, 5, and 6, including a description and evaluation of the natural environment, past research, and prehistoric and historic occupation of Lake Mead. Information contained in these chapters forms the basis for the research and management recommendations given in Chapters 7 and 8. Four broad problem areas identified for Lake Mead involve (1) culture history, (2) site function, (3) site distribution, and (4) human adaptation to arid lands. Although archeological research at Lake Mead has gone on for some time, the lack of well-defined and integrated research has left these problems unsolved. Therefore, we propose a five percent archeological survey of the recreation area.

In the recommendations for the proposed survey, we have emphasized both the fact that past research has provided some information on sites at Lake Mead and the need to evaluate the effects of recreation area activities on archeological resources. We recommend complete coverage of heavily used locations, listed in Table 3; this constitutes a three percent nonrandom sample. Another one-half percent nonrandom sample is suggested for surveying along existing roads and shorelines in areas not listed in Table 3, but where recreation area activities are also likely to affect sites. A final one and one-half percent sample is necessary to study holdings not adequately covered by past research or by the nonrandom sample. Most of this one and one-half percent sample should be a random sample using transects, quadrats, or both. It may also be desirable to use a portion of this sample to survey additional road, shoreline, or other nonrandomly chosen areas, for reconnaissance by helicopter or boat, or for restudying prehistoric and historic sites. Other research and management concerns which need to be considered involve visitor education, treatment of historic sites from an archeological perspective, survey of development areas not covered by the proposed five percent survey, report format, and the Lake Mead site master file.

APPENDIX I

Key to Maps Showing Locations of Pre-1970 Research Projects in Chronological Order (see Chapter 4 for project-by-project discussion; isolated reportings are not individually discussed).

KEY:
- a. Type of project; isolated report, survey, re-survey, excavation, re-excavation; date of work.
- b. Primary investigator or institution.
- c. Author and date of major publications; if none, source of information is given.
- d. Intensity of coverage.
- e. Quality of site or survey description and location information.
- f. Map on which plotted: Shivwits Plateau, Lake Mead, or Lake Mohave; other map references also given.
- g. Condition of site.

1.
- a. Isolated report on Fortification Hill site; date unknown.
- b. Rogers, San Diego Museum of Man.
- c. No publication; site information from San Diego Museum of Man files (#A-7).
- d. Intensity of coverage unknown.
- e. Very brief description of site; no exact location given.
- f. General site vicinity plotted on Lake Mead map.
- g. Site condition unknown.

2.
- a. Survey and excavation of Lost City sites in lower Moapa Valley; 1924-1935.
- b. Harrington, for Heye Foundation and Southwest Museum and as consultant for Civilian Conservation Corps work in later years.
- c. Harrington (1927b, 1936a), Shutler (1961).
- d. Intensity of coverage unknown.
- e. Harrington's publications give very general site descriptions; later, original notes used by Shutler in his synthesis of Virgin Anasazi culture; site cards have very little information; locations sometimes by township and range only, sometimes by section or quarter section.
- f. Survey area plotted on Lake Mead map; sites plotted on maps in Shutler (1961) and on map NRA Ne-BD 9121 on file at Western Archeological Center; other maps referred to on site cards filled out from 1934-1937 include NRA Ne-BD 8063, Bonelli Quad, and St. Thomas Quad (not located by us).
- g. Unclear which sites were excavated; many sites under water.

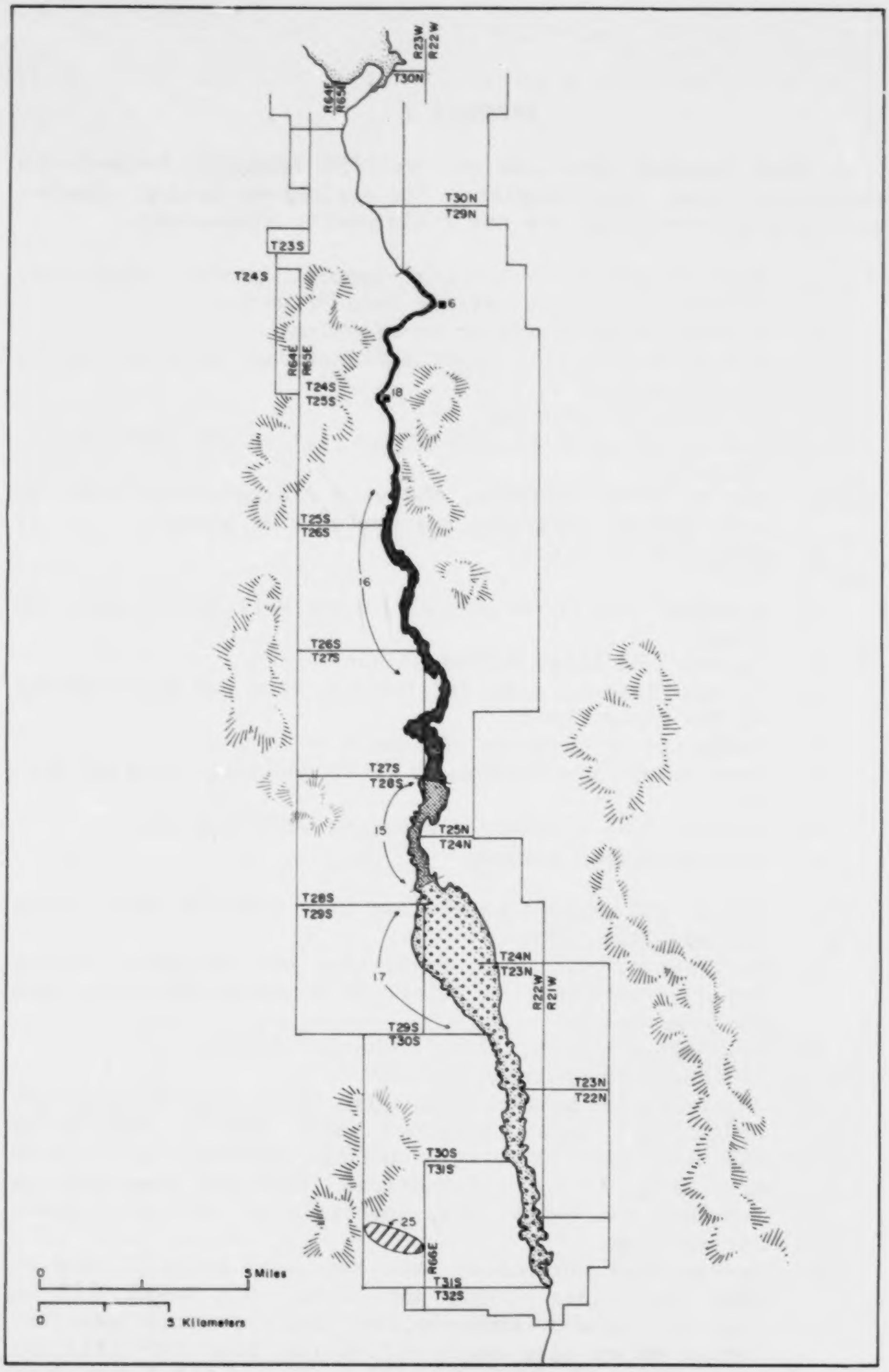
R23W
R22W
T30N
R64E
R65E
T30N
T29N
T23S
T24S
6
R64E
R65E
T24S
T25S
18
T25S
T26S
16
T26S
T27S
T27S
T28S
15
T25N
T24N
T28S
T29S
T24N
T23N
R22W
R21W
17
T29S
T30S
T23N
T22N
T30S
T31S
25
R66E
T31S
T32S
0
5 Miles
0
5 Kilometers

Fig. 21 Surveys of the Lake Mohave portion of Lake Mead National Recreation Area, before 1970. Numbers are keyed to Appendix I.

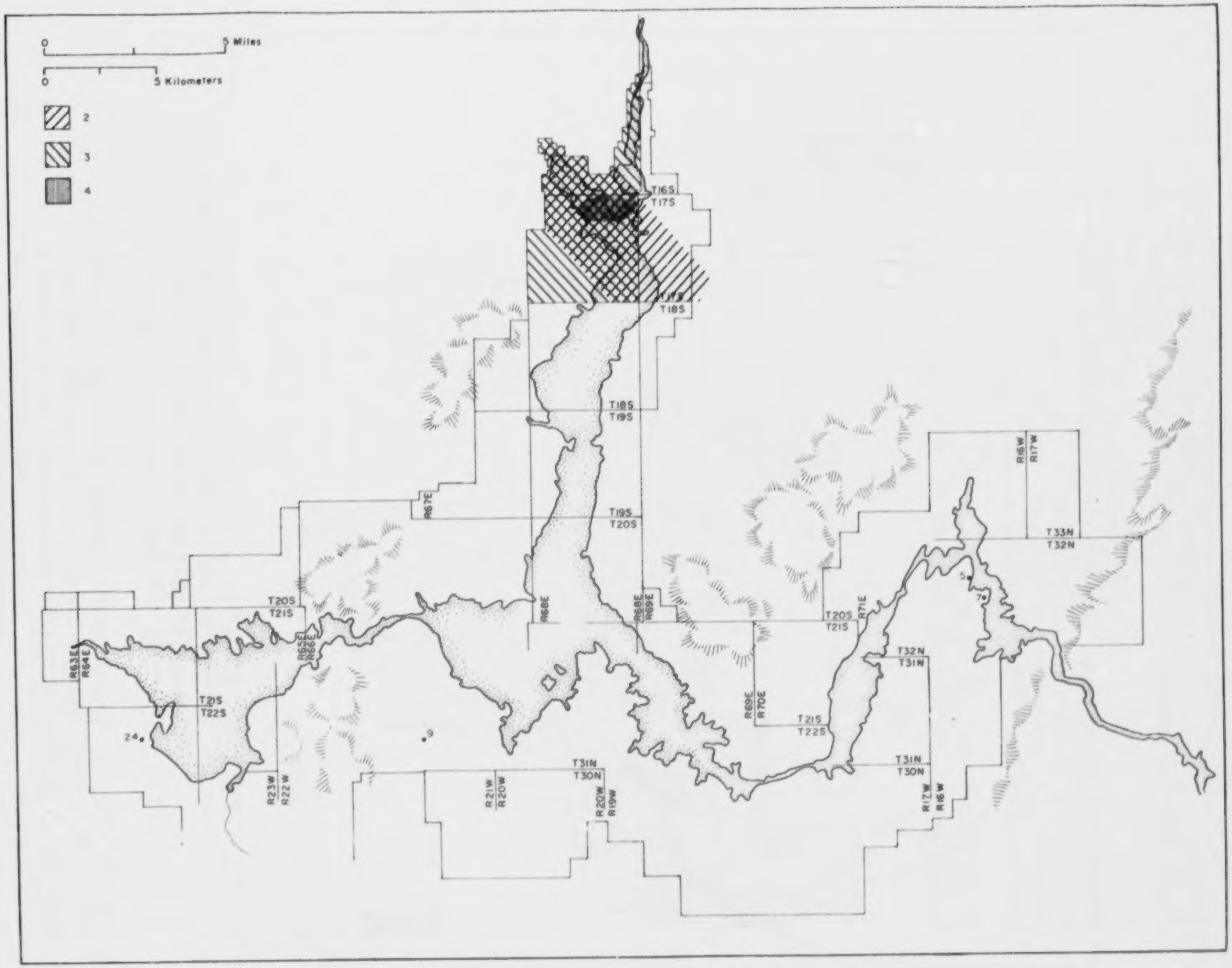
0
5 Miles
0
5 Kilometers
2
3
4
T16S
T17S
T17S
T18S
T18S
T19S
T19S
T20S
R67E
R68E
R68E
R69E
T20S
T21S
R65E
R66E
R63E
R64E
T21S
T22S
24
9
R23W
R22W
R21W
R20W
T31N
T30N
R20W
R19W
R69E
R70E
T21S
T22S
T20S
T21S
R71E
T32N
T31N
T31N
T30N
R17W
R16W
R16W
R17W
T33N
T32N
5
7

Fig. 22 Surveys of the Lake Mead portion of Lake Mead National Recreation Area, before 1970. Numbers are keyed to Appendix I.

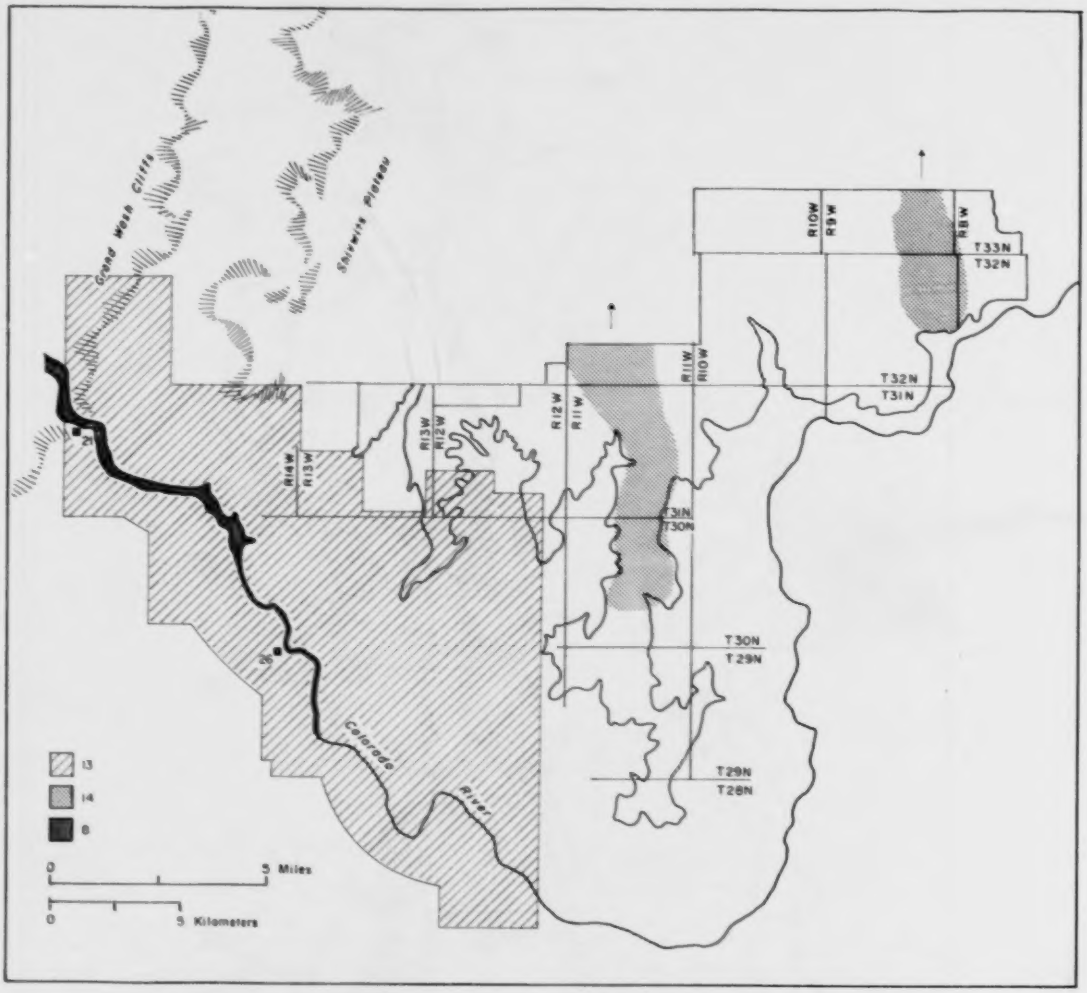
Grand Wash Cliffs
Shivwits Plateau
Colorado River
R14W
R13W
R13W
R12W
R12W
R11W
R11W
R10W
R10W
R9W
R8W
T33N
T32N
T32N
T31N
T31N
T30N
T30N
T29N
T29N
T28N
21
26
13
14
8
0
5 Miles
0
5 Kilometers

Fig. 23 Surveys of the Shivwits portion of Lake Mead National Recreation Area, before 1970. Numbers are keyed to Appendix I.

3. a. Survey (and re-survey?) in lower Moapa Valley, excavation of Mesa House Ruin and Paiute Cave; 1929.
   b. Harrington, Southwest Museum.
   c. Harrington (1930h, 1930k, 1937b), Hayden (1930b), Shutler (1961).
   d. Intensity of coverage unknown.
   e. 1930 publication gives general description of the two excavations but no information on survey; site cards give very little information, location by section; original notes used by Shutler in his synthesis of Virgin Anasazi culture.
   f. Survey area plotted on Lake Mead map; sites plotted on map N-C-LMV-O-Map #1 on file at Western Archeological Center.
   g. Many sites under water.

4. a. Survey in lower Virgin Valley; 1935?
   b. Schenk, National Park Service.
   c. Schenk (1935?).
   d. Intensity of coverage unknown, but includes only "points of interest."
   e. Publication gives very brief description of a few sites; no site cards on file bearing Schenk's name or this date; a few cards filled out by Civilian Conservation Corps may be the same sites Schenk reported.
   f. Vicinity of survey area plotted on Lake Mead map.
   g. Some sites probably excavated by Civilian Conservation Corps; many probably under water.

5. a. Excavation of Rampart Cave site (AZ A:13:8 NPS); 1936.
   b. Evans and Schenk, Civilian Conservation Corps.
   c. Harrington (1936a), Baldwin (1946a).
   d. Tested for associations of archeological remains with ground sloth; none found.
   e. Harrington's publication gives general description of cave and makes recommendations; Baldwin briefly describes 1936 excavation.
   f. Site plotted on Lake Mead map.
   g. Test excavated.

6. a. Excavation of Willow Beach site (AZ F:2:1 NPS, AZ F:2:2 ASM); 1936.
   b. Harrington, National Park Service.
   c. Harrington (1937e).
   d. Partial excavation.
   e. Publication gives general description of excavations; undated Museum of Northern Arizona card (NA 3389) filled out by Kepner gives little information; attached map shows location.
   f. Site plotted on Lake Mohave map.
   g. Partially excavated.

7. a. Isolated reporting; 1937.
   b. Hargrave and McGregor.
   c. No publication; site information from Museum of Northern Arizona files (NA 3494).
   d. Intensity of coverage unknown.
   e. Site card gives very little information; location plotted on an attached map by quarter section (appears to be under water at time mapped?) may be inaccurate.
   f. Site plotted on Lake Mead map.
   g. Under water?

8. a. Survey and excavation in lower Grand Canyon; 1937.
   b. Schenk, National Park Service.
   c. Schenk (1937b).
   d. Intensity of coverage unknown; only surveyed between certain elevations.
   e. Very general description of survey area and sites given in publication; site cards give very little information; locations by township and range only.
   f. Survey area plotted on Lake Mead and Shivwits Plateau maps.
   g. Unclear which sites excavated--Muav Cave was among those excavated; many sites now under water; (portions of survey area no longer part of Lake Mead--now part of the Grand Canyon National Park and Hualapai Indian Reservation).

9. a. Isolated reporting; 1938.
   b. Householder.
   c. No publication; information from Museum of Northern Arizona site files (NA 3788).
   d. Intensity of coverage unknown.
   e. Site cards give very little information; attached map shows location by quarter section; may be inaccurate.
   f. Approximate site location plotted on Lake Mead map.
   g. Site condition unknown.

10. a. Isolated reporting; 1938.
   b. Haury.
   c. No publication; information from Arizona State Museum site files (NEV DD:15:1 ASM).
   d. Intensity of coverage unknown.
   e. Site card has very little information; no location given.
   f. Not plotted on any map.
   g. Probably under water.

11. a. Survey and excavation in lower Moapa and Virgin Valleys; 1941.
   b. Baldwin, National Park Service.
   c. No publication; information from Lake Mead site files.
   d. Intensity of coverage unknown.

11. e. Very brief site descriptions on cards; location sometimes by township and range only, sometimes by section and quarter section.
f. Same area as item #2, continuation of earlier work begun by Harrington.
g. Unclear which sites were excavated.

12. a. Re-excavation of Rampart Cave; 1942.
b. Kellogg, U.S. National Museum and National Park Service.
c. Baldwin (1946a).
d. One quarter excavated.
e. Publication gives general description of excavation; no associations of archeological remains with ground sloth found; site card (filled out in 1941 by Baldwin and Schenk) gives very little information.
f. Plotted on Shivwits Plateau map, same as item #5.
g. Partially excavated; later work concentrated on paleontological studies; recently burned.

13. a. Survey and re-survey in lower (Western) Grand Canyon; 1941-1943.
b. Baldwin, National Park Service.
c. Baldwin (1948a).
d. Intensity of coverage unknown; re-survey of portions done earlier by Schenk, item #8.
e. Publication gives general description of some sites; site cards give very little information; locates sites by township and ranges, sometimes by section and quarter sections.
f. General survey area plotted on Shivwits Plateau map; site cards refer to maps 8085, NRA BD 9126 A-1-1 (group 2), and Arizona Grazing maps 8 and 9 (not located by us).
g. Some sites previously excavated, though unclear which ones (survey area no longer part of Lake Mead, now part of Grand Canyon National Park and Hualapai Indian Reservation).

14. a. Survey of Whitmore Wash and Shivwits Plateau; 1942.
b. Baldwin, National Park Service.
c. Baldwin (1942b).
d. Intensity of coverage unknown but undoubtedly uneven (spent only 16 days in field).
e. Some sites generally described in publication; site cards give very little information, location usually given by quarter section.
f. Survey area plotted on Shivwits Plateau map (continues north beyond Lake Mead boundaries); site cards refer to map 8085 and Arizona Grazing maps 8 and 9 (not located by us).
g. Site conditions unknown.

15. a. Survey and excavation in lower Colorado River (Willow Beach to Cotton Island); 1943 and 1947-48.
    b. Baldwin, National Park Service.
    c. Baldwin (1943a, 1948a).
    d. Intensity of coverage unknown; 1943 survey conducted by boat, car, and foot in 25 days; 1947-48 re-survey and excavation (including re-excavation of Willow Beach site, item #7).
    e. 1943 publication gives general description of some sites found; 1948 publication describes excavated sites; site cards give very little information, location by section.
    f. Survey area plotted on Lake Mohave map; site cards refer to archeological survey map 5/12/43 (not located by us); in 1943 report, 15 sites originally recommended for excavation--these are plotted on a map included in 1946 report.
    g. 1948 publication lists sites excavated; most sites probably under water.

16. a. Re-survey in lower Colorado River (Black Canyon to Mt. Davis); 1948.
    b. Kepner.
    c. No publication; information from Museum of Northern Arizona site files.
    d. Intensity of coverage unknown.
    e. Site cards are almost blank; locations not given; attached sketch map shows site locations--inaccurate.
    f. Survey area plotted on Lake Mohave map.
    g. Site conditions unknown.

17. a. Survey in lower Colorado River (Cottonwood Island to Davis Dam); 1949.
    b. Tuthill, San Diego Museum of Man for National Park Service.
    c. Tuthill (1949).
    d. Intensity of coverage unknown, undoubtedly uneven; covered by jeep and foot in 9 days; two areas not reached.
    e. Publication and site cards have very little information; location given by township and range only.
    f. Survey area plotted on Lake Mohave map; site cards refer to maps 11, 200, 201 (not located by us).
    g. Most sites probably under water.

18. a. Excavation of Catclaw Cave (AZ F:2:1 ASM, AZ F:2:52 NPS); 1949.
    b. Wright, University of Arizona and National Park Service.
    c. Wright (1954).
    d. Test excavated.

18. e. Thesis gives description of excavation and remains and interpretation; Bannister's 1950 site card (AZ F:2:1 ASM) gives general site description and location by U.S. Geodetic Survey Cable Number only; an undated card filled out by Schroeder (AZ F:2:52 NPS) gives no information.
    f. Site plotted on Lake Mohave map; sketch map in 1954 report.
    g. Site partially excavated.

19. a. Re-excavation of Willow Beach site; 1950.
    b. Schroeder, National Park Service.
    c. Schroeder (1961a).
    d. Publication synthesizes 1936, 1947-48, and 1950 excavations, describes and interprets remains.
    e. Partial excavation.
    f. Plotted on Lake Mohave map, same as item #6.
    g. Partially excavated; may be impacted by wave action and visitors.

20. a. Survey of Shivwits Plateau; 1950.
    b. Schroeder, National Park Service.
    c. Schroeder (1961a), Shutler (1961).
    d. Intensity of coverage unknown.
    e. Site cards give very brief descriptions; locations usually by section, sometimes quarter section; in publications, survey only mentioned, not discussed thoroughly.
    f. Survey boundaries unknown, therefore, not plotted; cards refer to map 8068 (not located by us).
    g. Site conditions unknown.

21. a. Isolated reporting (AZ A:13:27 NPS); 1954.
    b. Wallis, National Park Service.
    c. Wallis (1954) (site card refers to report in Lake Mead file under H2215; no copy in Western Archeological Center file).
    d. Intensity of coverage unknown.
    e. Site card with brief description, no location given.
    f. General vicinity of site plotted on Shivwits Plateau map.
    g. Site condition unknown.

22. a. Isolated reportings in Black Canyon area; 1955.
    b. Shutler.
    c. No publication; information from Lake Mead site files.
    d. Intensity of coverage unknown.
    e. Very brief site information on cards, location by township and range only.
    f. Not plotted on map.
    g. Site conditions unknown.

23. a. Survey and re-survey of Shivwits Plateau; site cards say 1956, publication says 1955.
    b. Shutler.
    c. Shutler (1961).
    d. Intensity of coverage unknown.
    e. General site descriptions, including site maps, on site cards; location by quarter section; publication gives very brief description of survey findings.
    f. Survey boundaries unknown; therefore, not plotted on map; site cards refer to Arizona Grazing maps 8 and 9 (not located by us).
    g. Condition of sites unknown.

24. a. Isolated reporting (NEV DD:13:7 ASM); 1956.
    b. Shutler.
    c. No publication; information from Lake Mead files.
    d. Intensity of coverage unknown.
    e. General site description on card, location by section.
    f. Approximate location plotted on Lake Mead map; site card refers to LMNRA Base Map, Sheet I of II.
    g. Site condition unknown.

25. a. Isolated reporting of sites in Grapevine Canyon; 1968.
    b. Moen.
    c. No publication; information from University of Nevada, Las Vegas, site files; mentioned in Brooks and others 1974.
    d. Intensity of coverage unknown.
    e. Site card gives very general description, location by township and range only.
    f. General vicinity plotted on Lake Mohave map.
    g. Condition of sites unknown.

26. a. Isolated reporting of Quartermaster Village site; date unknown.
    b. Recorder unknown.
    c. No publication; information from Museum of Northern Arizona files (NA 3805).
    d. Intensity of coverage unknown.
    e. Very brief site description on site card; attached map shows location to quarter section.
    f. Site plotted on Shivwits Plateau map.
    g. Site condition unknown.

APPENDIX II

Key to Maps Showing Locations of Research Projects of 1970 and Later in Chronological Order (see Chapter 4 for project-by-project discussion; isolated reportings and clearances are not individually discussed).

KEY: See Appendix I

1. a. Excavation of Grapevine Cave; 1970.
   b. Maxon, National Park Service, Lake Mead National Recreation Area.
   c. Maxon (1970).
   d. Partial excavation in 3 days.
   e. Publication gives description of excavation, remains, and interpretation; site cards filled out by Tuthill in 1949 (DDS-24) and Schroeder in 1951 (AZ F:14:5 NPS) gives brief site description on cards, location by township and range only.
   f. Site plotted on Lake Mohave map; Tuthill's site card refers to maps 11 and 200 (not located by us); Schroeder's site card refers to base map, Mohave City Quad (12) and Camp Mohave (11) (not located by us).
   g. Vandalized; partly excavated.

2. a. Excavation at AZ F:2:3 (NPS); 1971.
   b. Maxon, National Park Service, Lake Mead National Recreation Area.
   c. Maxon (1971a).
   d. Salvage excavation of burial eroding from sand bar.
   e. Report gives description of excavation and collections; original site card filled out by Baldwin (1943) gives very brief description, location by section.
   f. Site location plotted on Lake Mohave map.
   g. Located between high and low water lines, thus has been inundated; now partially excavated.

3. a. Survey of proposed development areas around Lake Mead (North Shore Road, Blue Point Spring, Bitter Springs, Callville Wash).
   b. Nevada Archaeological Survey, Southern Division.
   c. Brooks and Sedgewick (1971).
   d. Right-of-way surveyed up to one-half mile either side of North Shore Drive Road, but apparently only spot checked; unclear exactly what has been surveyed.
   e. Publication very briefly describes findings; site forms, included in report, give brief description of each site; maps in report show location of some sites; site forms give location by section (though many have wrong township, range, or section).

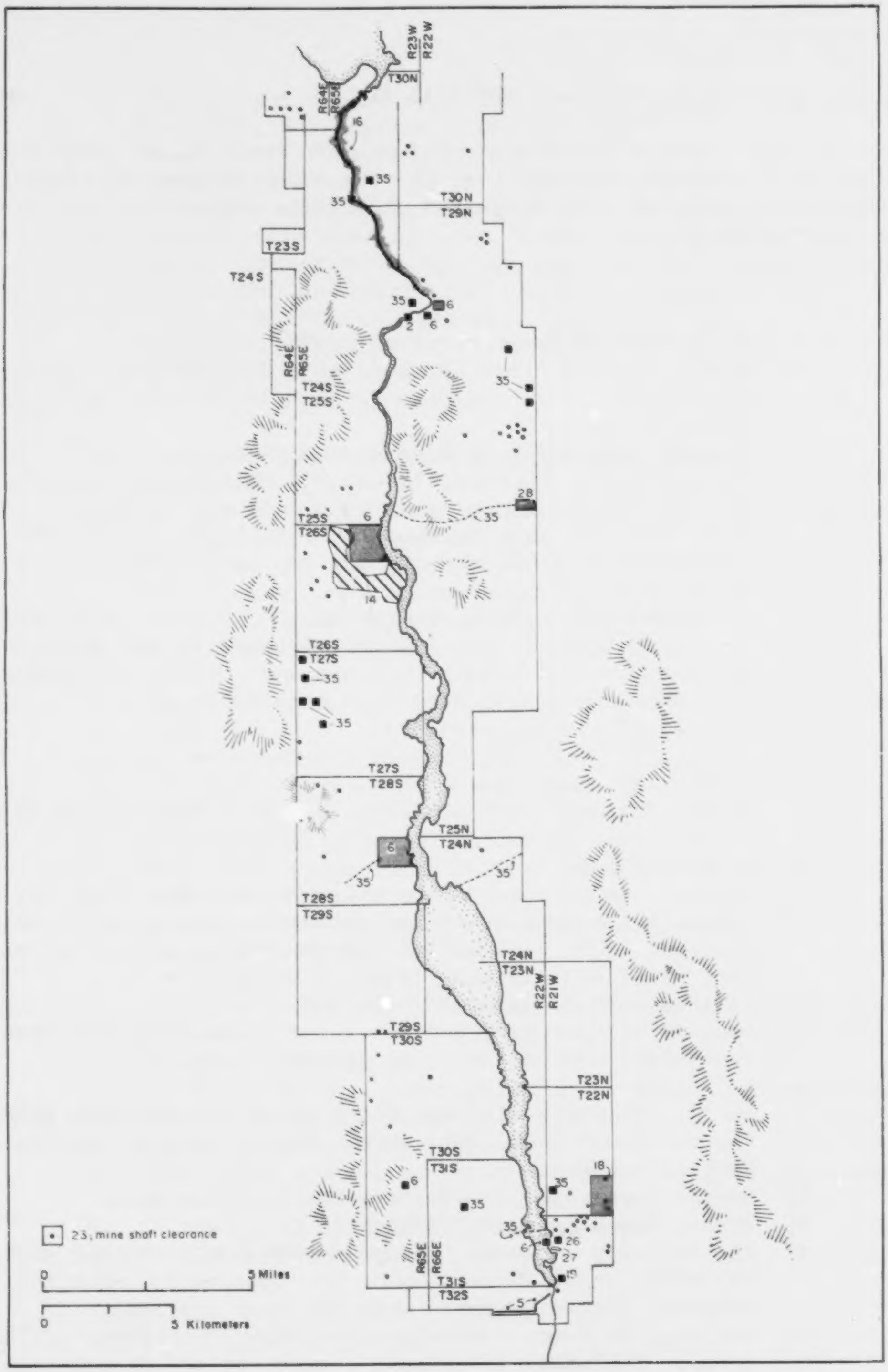
R23W
R22W
T30N
R64E
R65E
16
35
35
T30N
T29N
T23S
T24S
35
6
2
6
R64E
R65E
T24S
T25S
35
28
T25S
6
35
T26S
14
T26S
T27S
35
35
T27S
T28S
6
T25N
T24N
35
35
T28S
T29S
T24N
T23N
R22W
R21W
T29S
T30S
T23N
T22N
T30S
T31S
18
6
35
35
35
26
6
27
19
R65E
R66E
T31S
T32S
5
23; mine shaft clearance
0
5 Miles
0
5 Kilometers

Fig. 24 Surveys of the Lake Mohave portion of Lake Mead National Recreation Area, 1970-1978. Numbers are keyed to Appendix II.

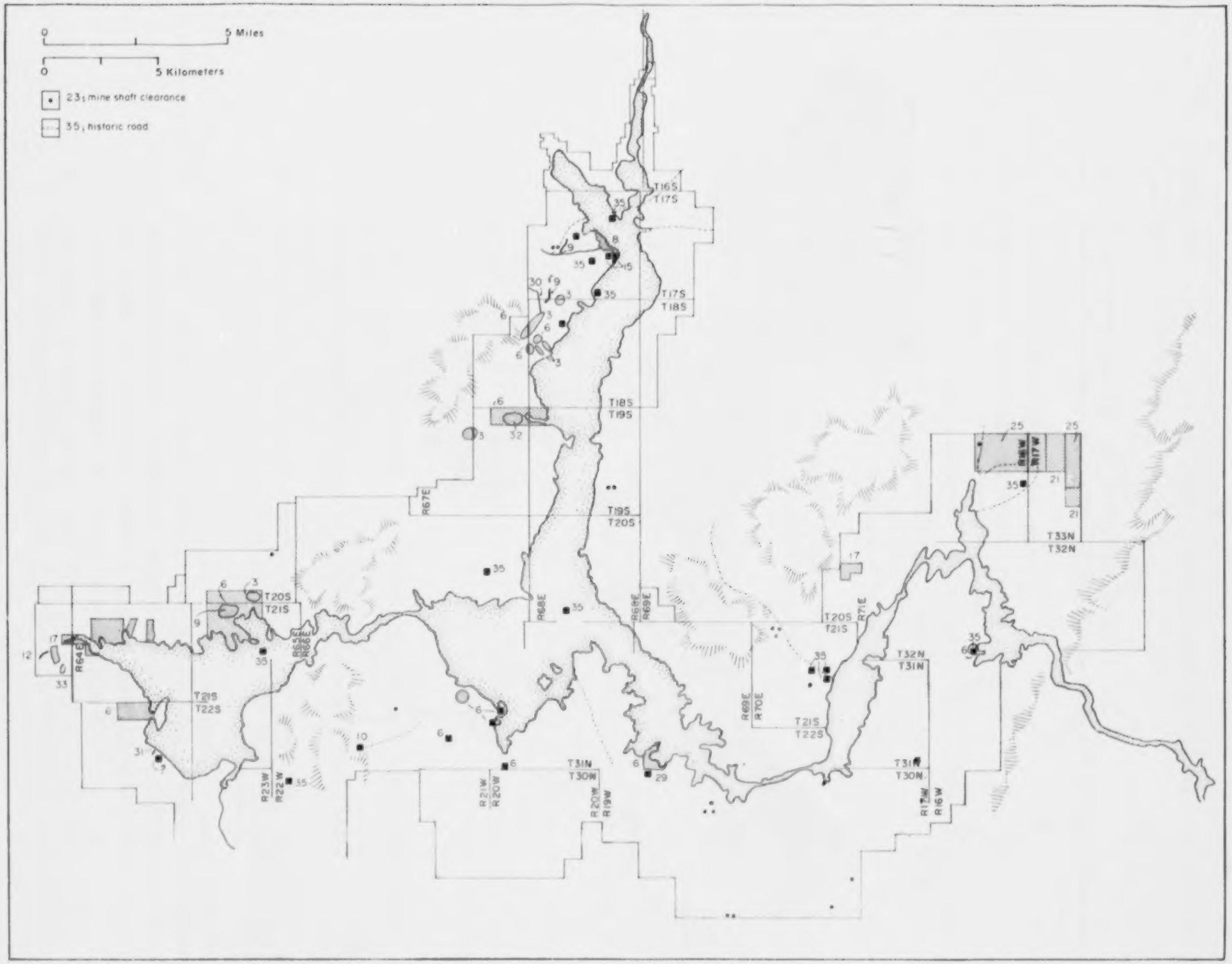
0
5 Miles
0
5 Kilometers
23; mine shaft clearance
35; historic road
T16S
T17S
T18S
T19S
T20S
T21S
T22S
T33N
T32N
T31N
T30N
R64E
R65E
R66E
R67E
R68E
R69E
R70E
R71E
R23W
R22W
R21W
R20W
R19W
R17W
R16W
R18W
35
8
15
9
30
3
6
32
17
12
33
31
10
29
25
21

Fig. 25 Surveys of the Lake Mead portion of Lake Mead National Recreation Area, 1970-1978. Numbers are keyed to Appendix II.

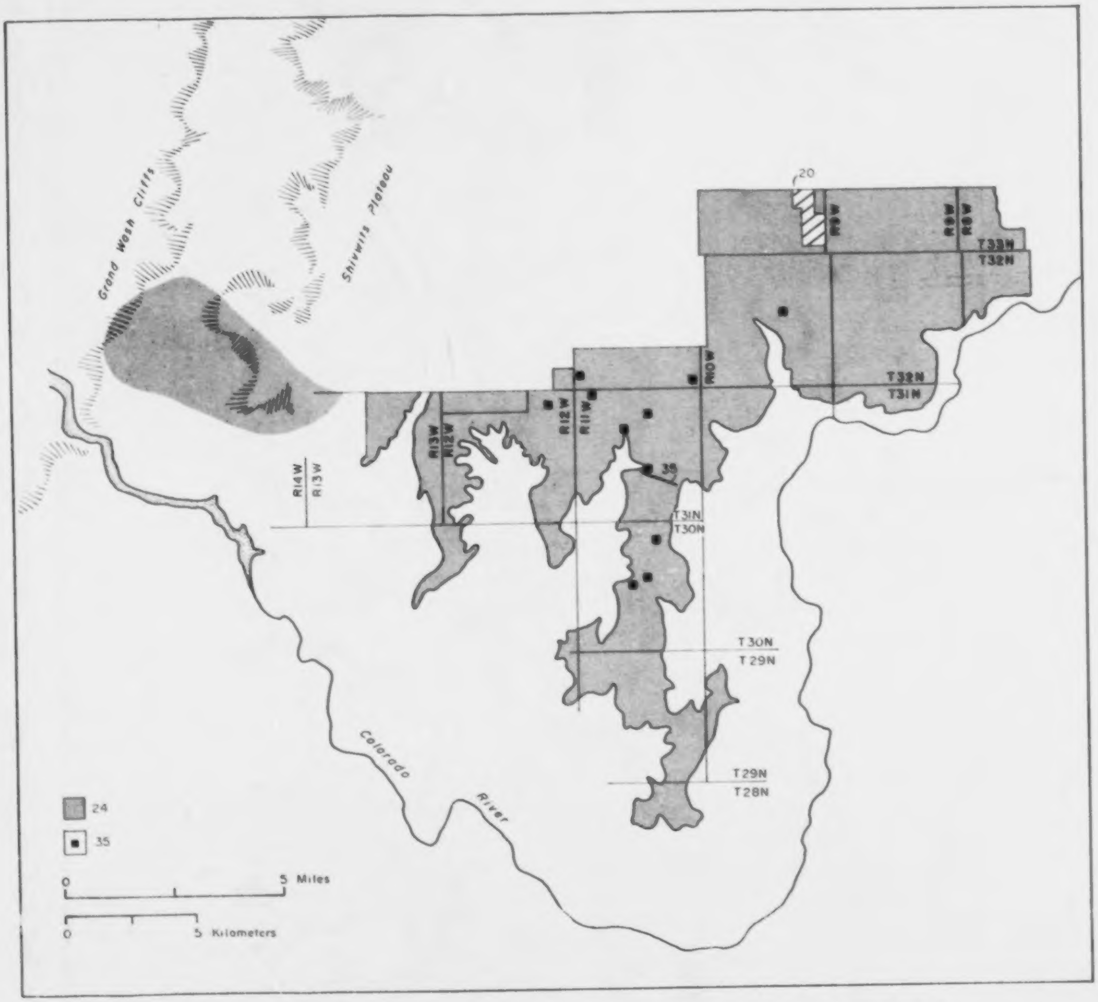
Grand Wash Cliffs
Shivwits Plateau
20
T33N
T32N
R10W
T32N
T31N
R12W
R11W
R13W
R12W
35
R14W
R13W
T31N
T30N
T30N
T29N
T29N
T28N
Colorado
River
24
35
0
5 Miles
0
5 Kilometers

Fig. 26 Surveys of the Shivwits portion of Lake Mead National Recreation Area, 1970-1978. Numbers are keyed to Appendix II.

3. f. Exact survey boundaries unclear; approximate survey areas plotted on Lake Mead map.
   g. Site conditions unknown except Rogers Spring, which had been vandalized.

4. a. Clearance survey at Overton Beach; 1972.
   b. Maxon, National Park Service, Lake Mead National Recreation Area.
   c. Clearance No. 010-Lake Mead.
   d. Complete coverage of development area.
   e. No archeological remains found.
   f. Exact location unknown; therefore, not plotted on map; sketch map with clearance report does not correlate with U.S. Geological Survey map.
   g. No sites; area previously disturbed by construction.

5. a. Survey of transmission right-of-way, 1973.
   b. Nevada Archaeological Survey, Southern Division.
   c. Bondley and Brooks (1973).
   d. Intensity of coverage unclear; appears to have been only spot checked as only 15 days of survey were used to cover 140 miles of 200-250-foot wide right-of-way.
   e. Report gives very general description of sites plus recommendations; site forms, included in report, give brief description of each site; location by quarter section (only three sites in Lake Mead area).
   f. Portion of survey area in Lake Mead, plotted on Lake Mohave map.
   g. Many of the sites probably disturbed by transmission line construction; most sites outside the recreation area.

6. a. Survey of proposed development areas in Lake Mead, 1971-74.
   b. Nevada Archaeological Survey, Southern Division.
   c. Brooks and others (1974).
   d. Development areas shown on maps in report not completely covered; unclear exactly what has been surveyed and what has not.
   e. Report gives general site descriptions, recommendations, and minimal interpretation; locations of proposed development areas given by section; xerox copies of U.S. Geological Survey topographic maps show site location.
   f. Various survey areas plotted on Lakes Mead and Mohave maps; see Chapter 4 for list of proposed development areas.
   g. Sites probably disturbed by visitors.

7. a. Isolated reporting (AZ A:13:1 ASM); 1974.
   b. Mead and Olsson.

7. c. No publication; site information from Arizona State Museum files.
   d. Intensity of coverage unknown.
   e. Site form and site card give general site description; location by township and range only.
   f. Exact location unknown; therefore, not plotted on map.
   g. Site condition unknown.

8. a. Survey of proposed development and road area at Overton Beach; 1975.
   b. Western Archeological Center.
   c. Dodge (1975).
   d. Complete coverage of development area and right-of-way, though more intensive on ridgetops.
   e. Report describes and interprets remains and gives recommendations; site location described and shown on map in report; site form and site card describe remains; location by quarter section and UTM; the site NEV DD:11:1 ASM extends beyond survey area.
   f. Survey area plotted on Lake Mead map.
   g. Disturbance by erosion, vehicles; collection minimal.

9. a. Clearance survey of development area at Callville Bay and telephone right-of-way at Overton Beach; 1975.
   b. Western Archeological Center.
   c. Quinn (1975; 1976a); Clearance No. 142 Lake Mead.
   d. Complete coverage of development area; right-of-way maps in report show site locations.
   e. Report gives general description of remains and makes recommendations; site cards and forms give general description; location by quarter section.
   f. Survey area plotted on Lake Mead map.
   g. Site at Callville collected in 1976.

10. a. Excavation of Arrastra Spring site; 1975.
    b. Kelly, National Park Service.
    c. Kelly (1978); National Park Service, final report in preparation.
    d. Excavated.
    e. Preliminary report gives description of excavation, remains, and interpretation.
    f. Plotted on Lake Mead map.
    g. Site vandalized before excavation; backfilled after recording.

11. a. Clearance survey at Las Vegas Wash; 1976.
    b. Western Archeological Center.
    c. Anderson and Stewart; Clearance No. 162 Lake Mead.
    d. Complete coverage of development area.

11. e. Clearance report gives description of remains, interpretation, and recommendations; report includes a map; location by UTM.
    f. Survey area plotted on Lake Mead map.
    g. Site conditions unknown.

12. a. Clearance survey at Las Vegas Wash; 1976.
    b. Western Archeological Center.
    c. Gilman; Clearance No. 197 Lake Mead.
    d. Complete coverage, except in wash itself where sewage was flowing.
    e. No remains found.
    f. Survey area plotted on Lake Mead map.
    g. N/A.

13. a. Clearance survey of powerline right-of-way at Boulder Beach; 1976.
    b. Western Archeological Center.
    c. King (1976a).
    d. Complete coverage of right-of-way.
    e. Report gives description of remains, interpretation, and recommendations; site forms give description of remains; location shown on xerox copy of USGS quad map.
    f. Survey boundary map not in report; therefore, not plotted.
    g. Site conditions unknown.

14. a. Survey of proposed development area near Fire Mountain; 1976.
    b. Western Archeological Center.
    c. Quinn (1976b).
    d. All but one area covered; coverage more intense on ridgetops and upper slopes and along flat washes.
    e. In report, remains described and interpreted and recommendations made; map shows location of survey area (including what was not covered) and site locations; forms and site cards give site descriptions and location by quarter section and UTM.
    f. Survey area plotted on Lake Mohave map.
    g. Site conditions unknown.

15. a. Survey of development areas at Overton Beach; 1976.
    b. Western Archeological Center.
    c. Quinn (1976c).
    d. Complete coverage of two development areas.
    e. In report, remains described and interpreted and recommendations made; map shows location of survey area and sites; site cards and forms give site descriptions and location by quarter section and UTM.
    f. Survey area plotted on Lake Mead map.
    g. Site conditions unknown.

16. a. Survey of lower Colorado River from below Hoover Dam to Willow Beach; 1977.
    b. Nevada Archaeological Survey, Southern Division.
    c. Brooks and others (1977).
    d. Covered only areas along arroyos entering Colorado River, terraces or benches above water level, and shelters up to 800' elevation, only when accessible from the river.
    e. Report gives general description of sites and recommendations; report includes site forms that give brief description of each site and location by section; report also includes a xerox copy of USGS map generally showing locations surveyed.
    f. Survey area plotted on Lake Mohave map.
    g. Site conditions unknown.

17. a. Clearance survey of Gentry mining claim; 1977.
    b. Western Archeological Center.
    c. Clearance No. 275 Lake Mead.
    d. Approximately 80 percent of area covered; steep slopes not covered.
    e. Only one broken pot found; described in clearance report; report also contains a xerox copy of USGS map showing survey area.
    f. Survey area plotted on Lake Mead map.
    g. N/A.

18. a. Survey in vicinities of Katherine Landing and Bullhead City; 1977.
    b. Western Archeological Center.
    c. Curriden (1977).
    d. Complete coverage of lands proposed for exchange.
    e. Report describes and interprets remains and makes recommendations; maps in report show location of survey area and sites; site forms and site cards give site description and location by quarter section and UTM.
    f. Survey area within Lake Mead plotted on Lake Mohave map (most of survey area outside of recreation area).
    g. Site conditions unknown.

19. a. Isolated reporting; 1977 (ADOT F-065-1[1] JctSR95&SR68; AZ F:14:4 ASM).
    b. Ferg and Hammack.
    c. No publication; information from Arizona State Museum site files.
    d. Intensity of coverage unknown.
    e. Brief site description on site card; location by quarter section and UTM.
    f. Site plotted on Lake Mohave map.
    g. Site condition unknown (undisturbed at time recorded).

20. a. Survey of Exxon mineral leases; 1977.
    b. University of Utah.
    c. Holmer (1977).
    d. Complete coverage of lease lands.
    e. Sites described and interpreted in report and recommendations made; maps in report show survey area and site locations; site cards give site descriptions and location by quarter section.
    f. Survey area plotted on Shivwits Plateau map.
    g. Site conditions unknown.

21. a. Survey of Wahl-Yee mineral lease (Grand Wash); 1977.
    b. Western Archeological Center.
    c. McClellan and Teague (1977).
    d. Complete coverage of proposed lease lands.
    e. Report summarizes and interprets remains and makes recommendations; map in report shows location of survey area and sites; site forms and site cards give site description and location by quarter section and UTM.
    f. Survey area plotted on Lake Mead map.
    g. Site disturbance minimal at time recorded.

22. a. Clearance of offshore construction projects at several marinas; 1977.
    b. Western Archeological Center.
    c. Stewart; Clearance No. 277 Lake Mead.
    d. Blanket clearance based on Southwest Region's underwater studies.
    e. N/A.
    f. Exact locations not given; therefore, not plotted.
    g. N/A.

23. a. Clearance of mine shafts to be fenced; 1977.
    b. Western Archeological Center.
    c. Stewart; Clearance No. 278 Lake Mead.
    d. Blanket clearance.
    e. Map attached to clearance report shows location, by quarter section, of mine shafts to be fenced; none have been field checked by an archeologist.
    f. Mine shafts plotted on Lakes Mead and Mohave maps; see map with clearance report for exact locations.
    g. Site conditions unknown.

24. a. Survey of lands adjacent to Grand Canyon (including Shivwits Plateau); 1977.
    b. Western Archeological Center.
    c. Teague and McClellan (1978).
    d. Less than 1 percent covered by randomly placed transects; about 5 percent covered by helicopter.

24. e. Report gives site descriptions, locations, interpretations and recommendations; maps in report show survey and site locations; site cards and site forms give site descriptions and location by quarter section and UTM.
    f. Portion of survey in Lake Mead plotted on Shivwits Plateau map.
    g. Site disturbance minimal at time of recording.

25. a. Survey of Mobil lease properties (Grand Wash); 1978.
    b. Western Archeological Center.
    c. McClellan and Phillips (1978).
    d. Complete coverage of lease lands.
    e. Report gives site description, locations, interpretations, and recommendations; maps in report show survey and site locations; site cards and site forms give site descriptions and location by quarter section and UTM.
    f. Survey area plotted on Lake Mead map.
    g. Site disturbance minimal at time of recording.

26. a. Clearance of Katherine utility area; 1978.
    b. Western Archeological Center.
    c. Hohmann; Clearance No. 27-78-Lake Mead.
    d. Complete coverage of development area and right-of-way.
    e. No remains found; clearance report has map showing location of survey area.
    f. Survey area plotted on Lake Mohave map.
    g. N/A.

27. a. Clearance of sewer system expansion at Katherine area; 1978.
    b. Western Archeological Center.
    c. Hohmann; Clearance No 28-78-Lake Mead.
    d. Complete coverage of right-of-way.
    e. Possible site described in clearance report; attached map shows location of survey area and possible site.
    f. Survey area plotted on Lake Mohave map.
    g. Minimal at time of recording.

28. a. Clearance survey of mining lease land; 1978.
    b. Western Archeological Center.
    c. Hohmann; Clearance No. 29-78-Lake Mead.
    d. Complete coverage of lease land.
    e. No remains found, area already disturbed; attached map shows location of survey area.
    f. Survey area plotted on Lake Mohave map.
    g. N/A.

29. a. Clearance survey of water system expansion at Temple Bar; 1978.
    b. Western Archeological Center.
    c. Hohmann; Clearance No. 30-78-Lake Mead.

29. d. Complete coverage of right-of-way.
    e. Brief description of remains in clearance report; other information in field notes on file at Western Archeological Center; attached map shows locations of survey area and sites.
    f. Survey area plotted on Lake Mead map.
    g. Sites mapped, photographed and collected; artifacts curated at the Western Archeological Center.

30. a. Survey of telephone cable right-of-way at Echo Bay; 1978.
    b. Western Archeological Center.
    c. Hohmann; Clearance No. 31-78-Lake Mead.
    d. No remains found; attached map shows location of survey area.
    e. N/A.
    f. Survey area plotted on Lake Mead map.
    g. N/A.

31. a. Clearance of powerline right-of-way at Boulder Beach; 1978.
    b. Western Archeological Center.
    c. Hohmann; Clearance No. 36-78-Lake Mead.
    d. Complete coverage of right-of-way.
    e. Questionable historic rock piles (probably modern) mentioned in clearance report; attached maps show location of survey area and rock piles (out of right-of-way).
    f. Survey area plotted on Lake Mead map.
    h. N/A.

32. a. Clearance of sewage lagoon No. 2 at Echo Bay; 1978.
    b. Western Archeological Center.
    c. Clearance No. 42-78-Lake Mead.
    d. Based on Brooks and others (1974).
    e. No remains found during Brooks' survey; attached map shows location of project.
    f. Project area not plotted on map; therefore, boundaries unclear from sketch map.
    g. N/A.

33. a. Clearance of No. 2 pit of sewage lagoon No. 2 at Las Vegas Wash; 1978.
    b. Western Archeological Center.
    c. Thornton; Clearance No. 46-78-Lake Mead.
    d. Complete coverage of development area.
    e. No remains found.
    f. Survey area plotted on Lake Mead map.
    g. N/A.

34. a. Clearance of dry dock at Cottonwood Cove; 1978.
    b. Western Archeological Center.

34. c. Clearance No. 50-78-Lake Mead.
    d. Clearance based on Brooks and others (1974).
    e. No remains found; attached map shows location of survey area.
    f. Survey area plotted on Lake Mead map.
    g. N/A.

35. a. Study of historic resources; 1978.
    b. Belshaw and Peplow.
    c. Belshaw and Peplow (1978); Belshaw (Chapter 6 of this report).
    d. Nonrandom study using documents, maps, and informants; not all of the sites have been field checked; none have received archeological study.
    e. Belshaw and Peplow report describes and interprets sites and makes recommendations; in Chapter 6 of this report, Belshaw summarizes historic Anglo period; Belshaw submitted a list of sites as part of this assessment; lists now part of Lake Mead master file.
    f. Most areas plotted on Lakes Mead and Mohave and on Shivwits Plateau maps; many of Belshaw's mine sites overlap with those plotted as item #23.
    g. Site conditions vary.

APPENDIX III

Lake Mead Archeology: A Bibliography

by

Richard H. Brooks
Sheilagh Brooks
and
Joseph P. King

(NOTE: This bibliography was compiled by the Archaeological Research Center, University of Nevada, Las Vegas, as part of a review of archeological research in Lake Mead National Recreation Area [Brooks, Brooks and King 1977]. It incorporates an earlier bibliography by Gordon C. Baldwin [1943b].

A few references have been added or changed by the authors of this assessment in order to bring the bibliography up-to-date. Selected references used by Belshaw in his historic resources study [Belshaw and Peplow 1978] have been included; readers are referred to that report for a more complete bibliography of the historic period.)

Aikens, C. Melvin

1966 Virgin-Kayenta Cultural Relationships. *University of Utah Anthropological Papers*, No. 79. Salt Lake City.

Amsden, Charles

1927 The Pecos Conference. *The Masterkey*, Vol. 1, No. 4, pp. 14-18. (Note p. 17 where "Southern" Nevada cave remains, excavated by M.R. Harrington, are considered Basketmaker I.)

1930 The Two Sessions Expeditions. *The Masterkey*, Vol. 4, pp. 4-12. (General discussion of work done in the Moapa area and at Gypsum Cave.)

1931 Man-hunting. Sidelights of a Symposium on "The Antiquity of Man in America." *The Masterkey*, Vol. 5, pp. 37-47. (Deals particularly with the Southwest Museum's excavations at Gypsum Cave, describing the sequence of prehistoric cultures and the geological age of the site.)

1933 The Prehistoric Southwest. *The Masterkey*, Vol. 7, pp. 140-147. (Short description of Gypsum Cave.)

1935 The Pinto Basin Artifacts. *Southwest Museum Papers*, No. 9, pp. 33-51. (Description of the stone artifacts from an early desert culture in southeastern California.)

1937 The Lake Mohave Artifacts. *Southwest Museum Papers*, No. 11, pp. 51-98. (Full description of the stone materials from a second early desert culture southwest of the Boulder Dam area.)

1949 *Prehistoric Southwesterners from Basketmaker to Pueblo*. Southwest Museum, Los Angeles.

Anderson, Keith M.

1963 Ceramic Clues to Pueblo-Puebloid Relationships. *American Antiquity*, Vol. 28, No. 3, pp. 303-307.

Antevs, Ernst

1935 The Spread of Aboriginal Man to North America. *Geographical Review*, Vol. 23, No. 2, pp. 302-309. (Includes brief mention of Gypsum Cave as one of the early finds.)

1937 Age of the Lake Mohave Culture. *Southwest Museum Papers*, No. 11, pp. 45-50.

Aschmann, Homer H.
1958 Great Basin Climates in Relation to Human Occupance. *Reports of the University of California Archaeological Survey*, No. 42, pp. 23-40.

Ashbaugh, Don
1957 Ghost Towns of Nevada - Rioville (Bonelli Ferry). *Las Vegas Review Journal*, 28 July.

d'Azevedo, Warren L., comp. and ed.
1963 The Washo Indians of California and Nevada. *University of Utah Anthropological Papers*, No. 67.

d'Azevedo, Warren L., Wilbur A. Davis, Don D. Fowler, and Wayne Suttles, eds.
1966 The Current Status of Anthropological Research in the Great Basin: 1964. *Desert Research Institute Social Sciences and Humanities Publications*, No. 1.

Bahti, Tom
1970 *Southwestern Indian Ceremonials*. K.C. Publications, Flagstaff.

Baldwin, Gordon C.
1938 Indian Tribes of Arizona. *Kiva*, Vol. 3, No. 5, pp. 17-20; Vol. 3, No. 6, pp. 21-24.

1942a Archaeological Field Work in the Boulder Dam Area. *Clearinghouse for Southwestern Museums Newsletter*, No. 51, pp. 186-187. Denver.

1942b Archaeological Survey of Whitmore Wash and Shivwits Plateau, Northwestern Arizona. Manuscript. Lake Mead National Recreation Area, National Park Service, Boulder City, Nevada.

1942c Archaeology in Southern Nevada. *Kiva*, Vol. 7, No. 4, pp. 13-16.

1943a Archaeological Survey of the Davis Dam Reservoir Area. Manuscript. U.S. Department of the Interior, National Park Service, Boulder Dam National Recreation Area.

1943b Bibliography of the Archaeology and Ethnology of the Boulder Dam National Recreation Area with a Supplement on the Archaeology and Ethnography of Lehman Caves National Monument. On file at National Park Service Headquarters, Boulder City.

Baldwin, Gordon C. (cont.)

1943c Archaeological Survey in Northwestern Arizona. *Clearinghouse for Southwestern Museums Newsletter*, No. 67, p. 236.

1944 Mescal Knives from Southern Nevada. *American Antiquity*, Vol. 9, No. 3, pp. 330-332.

1945a Letters to Frank Turek. On file at the library of the National Park Service, Lake Mead National Recreation Area, Boulder City. (Information on Mauv Cave, Lost City, Virgin River, and Rampart Cave.)

1945b Notes on Ceramic Types in Southern Nevada. *American Antiquity*, Vol. 10, No. 4, pp. 389-390.

1946a Notes on Rampart Cave. *The Masterkey*, Vol. 20, No. 3, pp. 94-96.

1946b Archaeological Field Work in Southern Nevada and Northwestern Arizona. *Boletin Bibliografico de Anthropologia Americana*, Vol. 6.

1948a Archaeological Surveys and Excavations in the Davis Dam Reservoir Area. Manuscript. National Park Service, Region 3, Lake Mead Recreation Area, Boulder City.

1948b Notes on Colorado River Basin Archaeology. *American Antiquity*, Vol. 14, No. 2, p. 128.

1950a Archaeological Survey of the Lake Mead Area. In *For the Dean: Essays in Anthropology in Honor of Byron Cummings*, pp. 41-49. Edited by Erik K. Reed and Dale S. King. Hohokam Museum Association, Tucson; Southwest Monuments Association, Santa Fe.

1950b The Pottery of the Southern Paiute. *American Antiquity*, Vol. 16, No. 1, pp. 50-56.

1963 *The Ancient Ones: Basketmaker and Cliff Dwellers of the Southwest*. W.W. Norton and Company, New York.

1967 Archaeological Survey of Whitmore Wash and Shivwits Plateau, N.W. Arizona. *Utah Archaeological Newsletter*, Vol. 13, No. 1.

Balknap, William Jr.

1941 The Saga of Queho: The Paiute Renegade Who Found Death in a Cave in Colorado Canyon Below Boulder Dam. *Arizona Highways*, Vol. 17, No. 9, p. 28.

Bancroft, Hubert Howe

1875 *The Native Races of the Pacific States of North America*, Vol. IV, pp. 713-714. D. Appleton and Co., New York. (Mentions salt mines and a ruined city, possibly Puebloan, in southeast Nevada.)

Barbieri, Joseph A.

1937 Technique of the Implements from Lake Mohave. *Southwest Museum Papers*, No. 11, pp. 99-108. (Discussion on flaking, percussion, and pressure chipping on the stone artifacts from the Lake Mohave Culture.)

Barre, S.

1970 Pottery Types from Five Sites in Southern Nevada. *Nevada Archaeological Survey Reporter*, Vol. 4, No. 1, pp. 11-15.

Bartlett, Katherine

1933 The Indians of Northern Arizona. *Notes from the Museum of Northern Arizona*, Vol. 5, No. 12, pp. 65-71.

1935 Prehistoric Mining in the Southwest. *Notes from the Museum of Northern Arizona*, Vol. 7, No. 10, pp. 41-44. (Refers to St. Thomas salt mines and Sugar Loaf Peak turquoise mine.)

1938 Notes on the Indian Crafts of Northern Arizona. *Notes from the Museum of Northern Arizona*, Vol. 10, No. 7, pp. 21-24. (Notes on the pottery and basketry of the Paiute, Mohave, and Hualapai groups.)

1945 The Distribution of the Indians of Arizona in 1848. *Plateau*, Vol. 17, No. 3, pp. 41-45.

Beal, Mary

1939 Food and Fishlines for the Tribesman. *Desert Magazine*, Vol. 3, No. 2, pp. 13-14. (Description of *Agave utahensis* of this area and its use by the Indians as food and cordage.)

Beals, Ralph L.

1934 *Material Culture of the Pima, Papago, and Western Apache*. National Park Service, Field Divison of Education, Berkeley, California.

Beals, Ralph L. (cont.)
1935 Preliminary Report on the Ethnography of the Southwest. National Park Service, Field Division of Education, Berkeley, California.

Beatty, Willard W.
1941 Indians Yesterday and Today. Information Pamphlet No. 1, U.S. Office of Indian Affairs, Education Division, Washington, D.C.

Belshaw, Mike and Ed Peplow, Jr.
1978 Historic Resources Study, Lake Mead National Recreation Area, Nevada. Research Report. Western Archeological Center, National Park Service, Tucson.

Bondley, George A. and Richard H. Brooks
1973 An Archaeological Survey of the Mead-Davis Parker 230 KV Transmission Line #2 P. 63. University of Nevada, Las Vegas.

Boothby, H.E.
1888 Ancient Canals in Nevada. The American Antiquarian, Vol. 10, No. 6, pp. 380-381. (Report from pioneer description of stone-lined canals in extreme southeast Nevada seen in 1849. One or two mounds reported; also pottery, some with clay vines and leaves.)

Bradley, W. Glen and Wesley E. Niles
1973 Study of the Impact on the Ecology of Las Vegas Wash Under Alternative Actions in Water Quality Management. Final report to the Las Vegas Valley Water District, Clark County, Nevada.

Breed, William J. and Evelyn Roat
1976 The Geology of the Grand Canyon, second edition. Museum of Northern Arizona, Grand Canyon Natural History Association, Flagstaff.

Brooks, Richard H. and Charles P. Sedgwick
1971 Report on the Archaeological Survey of the Proposed Road Right-of-Way from the Area South of Rogers Springs to Beyond the Turnoff to Overton Bay. Nevada Archaeological Survey, University of Nevada, Las Vegas.

Brooks, Richard H., Lawrence Alexander, and Robert H. Crabtree
1970 The 1969/70 Report on the Archaeological Survey of the Lower Colorado River, Nevada Archaeological Survey, Desert Research Institute. University of Nevada, Las Vegas.

Brooks, Richard H., Sheilagh T. Brooks, and Joseph P. King

1977 A Review of Archaeological Research in the Lake Mead National Recreation Area. Prepared for the National Park Service, Western Archeological Center, Tucson.

Brooks, Richard H., D. Ferraro, Daniel O. Larson, A.L. Cunningham, Joseph King, and Kathryne Olson

1977 An Archaeological Survey from below Hoover Dam to Willow Beach, Arizona. Bureau of Reclamation, Boulder City, Nevada.

Brooks, Richard H., Daniel O. Larson, Robert M. Leavitt, and Kathryne Olson

1974 An Archaeological Survey of Proposed Development Areas in the Lake Mead National Recreation Area, Nevada and Arizona; and a Preliminary Archaeological Inventory of High Use Recreational Areas within the Lake Mead Boundaries. Nevada Archaeological Survey, University of Nevada, Las Vegas.

Brooks, Richard H., Daniel O. Larson, Kathryne Olson, Joseph King, Gregory King, Robert M. Leavitt, and Patricia Anderson

1975 Prehistoric and Historic Research along the Navajo-McCullough Transmission Line Right-of-Way. Los Angeles Department of Water and Power. Report submitted by Nevada Archaeological Survey, University of Nevada, Las Vegas.

Brown, Alice

1974 Selected Bibliography of the Earth in Southern Nevada. Manuscript.On file at the Library of the University of Nevada, Las Vegas.

Burrier, Tom

1967 Queen of Desert Waters. Trailer Life, No. 9.

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APPENDIX IV

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